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THE AMERICAN ASSOCIATION FOR THE ADVANCEMENT OF SCIENCE

AMERICAN STANDARDS IN EDUCATION AND THE WORLD-STANDARD[1]

FOR the most part, higher education in America has been carried on by institutions singularly isolated one from another. Each has been a law unto itself. The state has conferred upon them academic powers, but has not defined their academic responsibilities. In a little less degree, the same separatism has prevailed in our secondary education, and again in less degree in our elementary schools.

We were individualists in our education, with institutions as our units, before we became out-and-out individualists, with single students as our units. It is hard to see how this individualism could now be carried further, unless it might be by extending the elective system down through the grades and into the primary school. The most radical advocates of free election, however, balk at the offer to six-year-olds of a choice between learning to read and learning to make mud pies. Here at least the doctrine of equivalence breaks down, and indeed it seems doubtful whether the elective system will spread very far beyond its present boundaries. Its great vogue in our best universities, its long ascendency, the personal weight of its ablest advocates —even these considerations can not disguise the fact that, in the long sweep of educational history, it is a mode, a fashion, a phase, and not the ultimate solution of a problem of the ages. In more trivial and

[1] Address of the Vice-president and Chairman of Section L. Baltimore, 1908.

irreverent speech, such a phase is commonly called a fad.

The most of our so-called educational fads are at least half true. We believe in them with all our hearts until they run into their inevitable exaggerations. All of us here to-day undoubtedly believe in the elective system, and we can never go back to the educational views and practises which that system has displaced. But we recognize the fact that it embodies somewhat less than the whole truth regarding an educational curriculum. In other words the utter disorganization of studies can not be taken as the final stage in the history of studies. It is rather a wholesome and necessary preliminary to a better and more humane organization.

It is a significant fact that, just at the time when the elective system is attaining its widest acceptance and our scholastic individualism is reaching its utmost limit in the studies of collegiate students, a new movement toward institutional coherence is setting in among our schools and universities. The first decade of the twentieth century seems destined to be a turning point in the history of common educational standards in this country. I should like to point out some of the characteristic features of this new movement, and to show that it can not stop short of becoming a world-movement.

It is fair to say that we have not been without standards in our earlier educational history, however vague and inadequate those standards may have been. The most definite and appreciable mark of scholastic competence which we have had within our own borders has been the degree of bachelor of arts, as conferred by our better colleges. The four-year course of these colleges has represented our conception of the measure of liberal culture attainable by any considerable number of our citizens, and the entrance requirements of these same colleges has been our norm for secondary education.

Such a standard, informally accepted by the country at large, might serve the purpose reasonably well while we were getting our systems of elementary and higher education for the first time into working order. Its inadequacies became manifest when we deliberately set about combining higher education and elementary education into one national and democratic system. And those inadequacies were accentuated when we found ourselves deliberately combining general education with special education, the liberal with the vocational, to provide a full-orbed preparation for the life of our time.

There were many ways in which such inadequacy appeared. One of the most baffling elements in the situation was found in the fact that our ready-made system provided no method for determining what were the really standard colleges. Harvard and Yale were the names that came most readily to the lips. But common report could not be deemed sufficient to decide the question when the actual and tangible interests of other widely scattered institutions and of their alumni were at stake. Even if Harvard and Yale were accepted without question as embodying the American standard, there was no obvious and adequate procedure by which other institutions could be measured up against them. And Harvard and Yale had differences of their own.

Some of the first steps toward the definition of a standard other than that of a single institution were taken by certain states, in the prescription of conditions governing the incorporation of colleges. Inasmuch as the power to grant academic degrees is by common consent in this country a power derived directly from the

state, this method of fixing a standard within state limits has been available from the beginning. But the states have been slow to apply it. The state of New York, in its university of the commonwealth, has had at hand the apparatus for making effective a legal provision touching this matter. With its growing sense of the possibilities of this organization, in recent years, it is not strange that New York has led the way in the making of definite requirements for degree-giving institutions.

The university law of 1892 authorizes the regents of the University of the State of New York to incorporate educational institutions and provides that no institution shall be given power to confer degrees in the state of New York unless it shall have resources of at least $500,000 and shall have suitable provision, approved by the regents, for buildings, furniture, educational equipment, and proper maintenance. Among the ordinances adopted by the regents under this enactment is one which provides that

> An institution to be ranked as a college must have at least six professors giving their entire time to college and university work, a course of four full years of college grade in liberal arts and sciences, and must require for admission not less than the usual four years of academic or high-school preparation or its equivalent, in addition to the pre-academic or grammar-school studies.

An act of the legislature of Pennsylvania approved June 26, 1895, provides that no institution of learning shall be given power to grant degrees until the merits of the application from an educational standpoint shall be passed upon by a College and University Council created by the act. The act further provides that

> No institution shall be chartered with the power to confer degrees, unless it has assets amounting to five hundred thousand dollars invested in buildings, apparatus and endowments for the exclusive purpose of promoting instruction, and unless the faculty consists of at least six regular professors who devote all their time to the instruction of its college or university classes, nor shall any baccalaureate degree in art, science, philosophy or literature be conferred upon any student who has not completed a college or university course covering four years. The standard of admission to these four-year courses or to advanced classes in these courses shall be subject to the approval of the said council.

Where there is present a state university of high grade, this institution can be made to serve as a rough-and-ready measure for the state. This is what was done in California, where the definite need of a scale of requirements arose when the licensing of teachers for public high schools was separated from similar provision for the elementary schools.

The provision referred to was enacted in 1893 and provides that no credentials for high school certificates shall be prescribed or allowed unless the same, in the judgment of the state board of education, are the equivalent of a diploma of graduation from the University of California. This law, therefore, makes of the state board a body for the classification of higher institutions, with the university of the state as the standard of measurement.

In 1907 the state educational board of examiners of Iowa were granted authority to accept graduation from the regular and collegiate courses in the state university, state normal school, and the state college of agriculture and mechanic arts, and from other institutions of learning in the state having regular and collegiate courses of equal rank, as evidence that a teacher possesses the scholarship and professional fitness for a state certificate. They were authorized also to validate certificates from other states where such certificates were issued upon scholarship and experience equivalent to that required under the laws of Iowa.

While such provisions as these have been adopted in a few of the states, there have

been numerous beginnings made in the past few years, by educational boards and associations of wider scope, to set up standards in different portions of the educational field.

The Association of Collegiate Alumnæ, which was organized in 1882, admits to its membership graduates of institutions whose work and equipment have been approved by the Association. Inasmuch as the association deals only with institutions to which women are admitted, its scope as a standardizing body is limited to colleges for women and coeducational institutions. The standard adopted by this Association has not been published and is understood to be in process of revision.[2]

The Association of American Universities was organized in 1900 for the purpose of considering matters of common interest relating to graduate study. Among the important items mentioned in the invitation to the conference which resulted in the formation of the Association was the consideration of means to secure in foreign universities "such credit as is legitimately due to the advanced work in our own universities of high standing." The initial membership of the Association consisted of fourteen universities. At the present time there are eighteen members.[3]

In 1906 a committee was appointed by this body to report on the aim and scope of the Association. The committee's report was made and unanimously adopted at the meeting at Ann Arbor, Michigan, in January, 1908. It recommended that in addition to a strong graduate department, which had previously been the sole condition of membership in the Association, there should be adopted as a second criterion for membership the requirement of one or more years of college work as a prerequisite for admission to professional courses, the combination being so arranged that no professional degree should be given until the satisfactory completion of at least five years of study.

In order that no substantial hardship might be imposed by a strict enforcement of both requirements at the present time, the committee recommended that in universities which have professional schools and a graduate department, the graduate department shall at least be creditable, and that the arts and technical work prescribed for professional degrees in at least one professional school shall be not less than five years. The Association undertook, through a special committee, to make a list of the colleges of the country whose degrees are to be regarded as of equal value with the college degrees conferred by members of the Association.

The College Entrance Examination Board was organized in 1900 to bring about as rapidly as possible an agreement upon a uniform definition of each subject required by two or more colleges for admission; to hold or cause to be held a series

[2] Since this paper was written the Association of Collegiate Alumnæ has published a revision of its standard. Summarized briefly the conditions for eligibility to membership include entrance requirements demanding at least four years of secondary school work; graduation requirements corresponding to amount of work ordinarily included in four years of serious college study; the number of full professors, total property, and productive endowment shall not be less than the minimum in institutions already admitted to membership; the ratio of full professors to students and of instructors to students, number of laboratories, number of books in the library and number of departmental journals shall be at least as large as the average number in institutions of the same type already admitted to membership; no preparatory department shall be under the government or instruction of the collegiate faculty; the salaries of the teaching staff shall not be lower than the minimum for the same grade in institutions already admitted to membership where the living conditions are similar.

[3] This number was increased to twenty-two at the annual meeting held in January, 1909.

of college admission examinations, with uniform tests in each subject; and to issue certificates based upon the results of such examinations. The constitution of this Board provides that a college or university may, upon application, be admitted to its membership, provided that in the college applying for admission:

(1) There shall be specifically defined and consistently carried out, whether by examination or certificate (or for the admission of special students), requirements for admission which shall in every case be equivalent to a four-year course in a college-preparatory or high school of good grade, able to prepare its pupils for admission to the colleges already belonging to this Board. (2) The members of the faculty shall have an academic training adequate to maintain a high standard of teaching; they shall bear a proper proportion to the students to be taught, and shall be sufficient in number to permit of proper specialization in the subjects assigned to each individual instructor. (3) The breadth of the college curriculum, the standard of graduation, the grade of work and the amount of work demanded, shall be proper subjects of inquiry by the Executive Committee, and shall constitute factors in determining their decision. (4) There shall be no preparatory department under the government or instruction of the college faculty. (5) There shall have been for at least three years preceding the application for admission an average of at least fifty students in the regular entering classes (courses in arts and in science to be reckoned together for this purpose). (6) There shall be a free income-bearing endowment yielding in no case less than twenty thousand dollars annually, or in the case of state universities and colleges an equivalent annual appropriation from public funds, expended exclusively on the undergraduate department; as well as libraries, laboratories, buildings and equipment adequate to maintain the degree of efficiency and the standard of scholarship contemplated in the above provisions.

The Carnegie Foundation for the Advancement of Teaching was created in 1905 for the purpose of administering a fund for pensioning college professors. Its governing board adopted, in April, 1906, regulations fixing an educational standard for the institutions which should be counted as eligible to participate in the benefits of this fund. The definition of a college adopted by the Foundation is practically that in use by the regents of the University of the State of New York. It is stated in the following terms:

An institution to be ranked as a college must have at least six professors giving their entire time to college and university work, a course of four full years in liberal arts and sciences, and should require for admission not less than the usual four years of academic or high school preparation, or its equivalent, in addition to the pre-academic or grammar-school studies.

A technical school to be eligible must have entrance and graduation requirements equivalent to those of the college, and must offer courses in pure and applied science of equivalent grade.

To be ranked as a college an institution must have a productive endowment of not less than two hundred thousand dollars.

Because of its ability to give or withhold valuable grants, and its declaration that these grants will be made only to institutions of a certain academic grade, and further because of adequate provision in the office of the Foundation for the investigation of all institutions applying for such grants, this establishment has become one of the most powerful agencies for clearing up and unifying our standards in higher education. It is doubtful whether all of the agencies working directly to this end, taken together, have thus far accomplished so much in the fixing a norm of collegiate education in this country as has been done, under far-sighted direction, in the short term of its activity hitherto, by the Carnegie Foundation.

The National Conference Committee on Standards of Colleges and Secondary Schools is an outgrowth of two annual conferences of delegates from a number of the associations of colleges and preparatory schools of the country, the first of which was held at Williamstown in 1906. At the third annual meeting of delegates from

these several associations in April, 1908, the National Conference Committee[4] was organized. It adopted a resolution urging the organizations represented in the committee to collect data concerning the standardization of colleges and universities and to give special attention to the study of this subject.

The National Association of State Universities appointed a committee on standards of American universities in November, 1905. A report was presented to the Association in November, 1908, which included the following recommendations: That the standard American university be defined as an institution which requires for admission the completion of a standard four-year high school course or its equivalent; which offers two years of general or liberal work; which offers a further course of two years so arranged that the student may begin work of real university character leading to the bachelor's degree at the end; which offers professional courses in law, medicine and engineering, based upon the completion of two years of college work; and which offers in the graduate school an adequate course leading to the Ph.D. degree.

Thus far attention has been called to the steps which have already been taken by states and by various national bodies, toward a better determination of the grade of our collegiate institutions. In addition to these acts and resolves, some notable efforts have been made to fix the standards of our professional education. Two instances of unusual significance may be noted here.

In 1904 the American Medical Association created the Council on Medical Education to act as its agent in efforts to elevate the standards of medical education. This Council holds an annual conference and makes recommendations concerning the improvement of medical education, which recommendations are then presented to the Association. It has classified the medical colleges of the country according to the percentage of failures of graduates of these colleges before state medical examining boards; it has published lists of medical colleges making certain admission requirements; and it has proposed what is held to be an ideal scheme of medical education.

The National Association of Dental Examiners was organized in 1883. It has formed a list of reputable dental schools, which list is revised from year to year. It works in close relations with the National Association of Dental Faculties, in the endeavor to advance the standards of dental education. Many difficulties have attended this undertaking and its history is full of interest.

This is by no means a complete list of the agencies now engaged in the effort to give at least an ascertainable significance. But as it stands the showing is noteworthy. It leaves no doubt that widespread and serious attention is now directed to this subject. The reproach against our American education that it means anything or nothing according to circumstances, is not merely resented or ignored, nor is it merely accepted as inevitable. Steps are taken to remove the sting from that reproach by making it no longer applicable. We see more clearly the difficulties of our situation, but we see also the hope of

[4] The committee consists of delegates from The New England Association of Colleges and Preparatory Schools; New England College Entrance Certificate Board; Association of Colleges and Preparatory Schools of the Middle States and Maryland; College Entrance Examination Board; North Central Association of Colleges and Secondary Schools; Association of Colleges and Preparatory Schools of the Southern States; National Association of State Universities, and Carnegie Foundation for the Advancement of Teaching. The United States Commissioner of Education is *ex officio* a member.

remedy. For now some fifteen or twenty years the movement toward a betterment has been going on, but its more definite and encouraging developments belong mainly to the new century.

The question can now be fairly put to the legislatures of the several states: Is it just and right to incorporate institutions for the instruction of our people and authorize them to give academic degrees and certificates, with no provision for determining the meaning and worth of those scholastic labels? It is not merely an academic question. It is a moral question. False pretenses in the realm of education are a peculiarly flagrant form of fraud, for they cheat our American youth of their American right to a fair chance. They operate no less disastrously when the fraud is unconsciously committed, that is, when incompetent teachers and school authorities offer an inferior grade of instruction under the delusion that it is as good as the best. The well-meaning no less than the dishonest need some impartial test by which their educational offering may be proved, of what sort it is.

The pure-food agitation has undoubtedly lent new point to this standardizing movement. It has strengthened the conviction that the public is entitled to know what it is getting, in a matter that vitally affects human health and human life. It is extremely difficult to devise and carry into effect a plan that will secure such publicity without doing violence to personal rights. But since these difficulties have not proved insurmountable in the case of foods and drugs, we have courage to believe that the greater difficulties attending a standardizing of education will not prove insurmountable. There is even more of human welfare at stake in the case of education than in the former case.

It should be said at this point that to adopt a standard does not mean to bring all institutions up to an actual level. Even if that were possible, it would not be desirable. A new institution in a sparsely settled region, for example, may fairly aim at being ultimately a university, and yet may render its best service through all of its earlier years by maintaining only a good secondary or preparatory school. Whether it shall follow this course or not is a local question, to be determined in accordance with local needs. But if its real high school is allowed to stand as a make-believe college, we have a case of false pretenses, and grievous wrong is done the state, the community, and, most of all, the students of the school. Another illustration comes to me in a personal recollection. The head of a law school, himself a thoroughly trained university man, once told me of the standing of his school. Its requirements for admission were lower than those of the best law schools, but were distinctly announced for what they were. Its requirements for graduation were less severe than those of leading schools, but they were clearly stated and strictly enforced. The faculty was made up of competent men, each of whom gave to the school only a part of his time, but gave regularly what was announced as his part. Summing up, my informant said to me, "This is not a first-class school. It does not pretend to be. But it is a first-rate second-class school. I find a need for a law school of this grade in the community and we are meeting that need."

I can conceive that in many communities there may be some need that can best be met by a second-class school. But if that school declares itself to be what it is and makes itself a first-rate school of its class, it may render an honorable service to the community and may even be a force making for righteousness.

We have had two or three notable instances of late of institutions which have deliberately renounced the name of *university* to take the more modest title of *college* or *institute*. The training school for teachers which I attended in my youth was burdened by law with the title *state normal university*. It made no pretense, however, of being a university, and I well recall hearing its downright president declare repeatedly before the assembled students, "This is not a college. It is a normal school."

It is, then, the moral gain that is the chief good to be had from a clear definition of our standards. But other advantages, too, are obvious. For many institutions, to define their standard is to raise their standard, and this is gain, save in the few instances where the higher standard may represent requirements that are really excessive. The possibility of measuring the work of institutions even far remote from the centers of population and culture, will give needed encouragement to groups of devoted teachers who are worthy of such encouragement. Small and isolated colleges will gain new hope of winning and holding each a local constituency, and so of making strong local centers of science and cultivation, when their claims to academic competence can be fairly tested and approved.

There are two further advantages which call for special emphasis, one of them material and the other in the nature of sentiment. Where common standards are widely understood and applied, the graduate of a given institution will find no difficulty, even in remote parts of the land, in securing recognition for his scholastic credentials. This is of especial importance when those credentials have to do with his occupation in life, as is the case with teachers, physicians, and those engaged in other professional pursuits. Even where the practise of the profession is guarded by regular examinations, a professional diploma is important, as establishing the holder's *prima facie* claim to recognition. It is desirable, too, that our diplomas and professional certificates may become so clear in their meaning and so reliable as regards the conditions on which they are issued, that they may safely take the place of professional examinations, or at least of the more elementary and vexatious portions of such examinations. The lack of comity as between the several states with regard to the practise of the professions is one of the extremely unsatisfactory conditions affecting our professional life at the present time. We can not accept this condition as necessary. It can undoubtedly be remedied. But the remedy lies in making the meaning of our academic and professional credentials at least an ascertainable datum. Here is a consideration, having serious relation to our material needs, which strongly accentuates the movement we are reviewing.

Then the sentimental consideration. Our state pride and our institutional loyalty are both of them factors in our real and effective life. But our state pride suffers when we find the schools of our state disparaged or even discredited by comparison with those of other states; and our loyalty to our own institution, even if it be of no higher grade than that which goes by the name of "college spirit," insists that our college shall not fall below the grade of the best colleges in the land. The comparison is inevitably made with what is believed to be the best in other parts of our common country. A national standard is recognized even when it can not be clearly set forth. And the state or the institution which undertakes to grade its own educational performance without reference to that national standard soon suffers embarrassment and eventually suffers a positive disadvantage and loss, both for itself and for its graduates.

What has been said thus far with reference to the imperative need of national standards as a corrective of merely local and provincial standards, leads up, I believe inevitably, to the view that no national standard can be adequate or stable until it has been consciously referred to the world-standard of our time. In endeavoring to establish American standards, we must not stop short of this ultimate step, the critical comparison of the standards proposed for our own land with those recognized by the rest of the civilized world. Otherwise we shall simply have passed from one provincialism to another—a broader, more conspicuous, and therefore more glaring—provincialism.

It may be said of the world-standard in education, as was said of the national standard, that it is already in existence, but only dimly apprehended as yet. There is so much of free intercourse between the culture-nations of the modern world, that a comparison of scholastic ideals and processes is continually going on. An important section of our current educational literature is devoted to such comparisons. But these comparisons are still for the most part unsystematic and fragmentary. The attempt has hardly been made as yet to determine to what extent a consensus of international opinion has already been reached in any of the central questions involved, or what sort of agreement is attainable by conference and by the systematic interchange of instructors, students, and practitioners in the several professions.

It would be an interesting academic exercise to trace the gradual and unnoticed development of this international standard since the time when modern nationalism replaced the cultural unity of the medieval world. We may be sure that such an investigation would bring many surprises. But our present problem is practical rather than historical. The same needs and forces which have made the question as to national standards a pressing and vital question, are operative to-day on the international plane. Within the past three years this question has repeatedly come before the Department of State at Washington, on representations from officials of our diplomatic and our consular service. American citizens—physicians, dentists, candidates for higher degrees in foreign universities—have repeatedly found themselves at a disadvantage owing to the lack of a basis for comparison of their scholastic credentials with the requirements of those foreign countries of which, for the time, they are residents. It is not generally known how delicate and embarrassing are some of the difficulties which have been encountered in this field, and how little progress has yet been made toward a satisfactory adjustment of those difficulties.

Not only the practical exigencies of the case, but national sentiment as well, must prompt us to seek for such provisions as shall place the products of American education on a basis of fair comparison with those of other great educational systems. In so far as our works suffer by the comparison, they should be improved. In so far as the comparison places us in an unfavorable light because of a misunderstanding of what we are actually accomplishing, we must see to it that our system shall be more adequately set forth. Our educational relations with the rest of the world can never be on a satisfactory basis till we are in a position to do our full part in determining what the world-standard shall be.

We do not seek to prescribe standards for the rest of the world. We are not willing that the rest of the world should simply prescribe standards for us. But we do seek to gain and maintain an acknowledged position among the foremost culture nations, such that our influence shall not

be less than that of any other people in determining what shall be the universally recognized norms of scholastic competence.

In this discussion I would not blink either the difficulties or the dangers of the standardizing movement. The dangers are many and real, chief among them that of imposing on our educational institutions a flat uniformity, which would take no account of wholesome individualities nor of provision for local and special needs. This is a serious danger, even where the standard is imposed by influence only, and not by authority. The difficulties of the situation, too, are vastly greater than any superficial inquiry would reveal. The chief of these is the difficulty of finding criteria by which the real effectiveness of educational systems may be measured. Certain time measures most readily present themselves —the number of years in the course, the hours of instruction per week, the number of students per teacher, the years of special training which the teachers themselves have enjoyed. These are obviously inadequate, yet they serve a useful purpose. They measure the skeleton and so reveal the stature of a course of education. But more subtle measures are needed to measure the flesh and blood and spirit of instruction, that which gives it its power and human significance. And how shall we ever gauge that finer inspiration which makes of some schools a center of creative and re-creative energy!

Incalculable differences there must always be even among schools and systems that are classed together. But the need for some working estimate of comparative values remains and can not be put aside. Even a rough measure of the stature of institutions of learning will serve a purpose and such a measure is urgently required in these days.

It is clear that the question of equivalence among widely different materials and processes must enter into this problem. It is a question which presents great difficulties, both theoretical and practical. Yet some rough-and-ready estimate of equivalence has long been made in the highest educational institutions. Wherever the degree of Doctor of Philosophy is bestowed, for work done and not *honoris causa,* a common designation has been applied to the most various attainments. The substance has been largely ignored in the bestowal of this degree, and attention has been directed instead to the mastery of method. Where so great divergence has been allowed without loss of essential unities, it would seem possible that recognition can be freely extended to widely different educational systems, even if those differences be international, without renouncing all claim to a common and lofty standard.

This is one point for which we of the United States will undoubtedly have to contend in any world-concert as regards education. We are committed to a fair range of individuality in education, both institutional and personal. We do not assume in advance that any form of education is inferior because it is different from others. And we can not permit the rest of the world to judge any part of our education as inferior simply because it is different. Probably a majority of marked variations will prove to be of inferior quality; and others that are on their way to the highest excellence will seem inferior for a time, until their character is fully established. But with us the variant is to be welcomed and given its fair chance, for our system is always alive to the hope of far-reaching improvement. We shall be able to justify this attitude before the rest of the world so far, and only so far, as our educational achievement in general shall show a sustained and appreciable excellence.

The argument comes to this, that our American endeavors to set up definite edu-

cational standards can not be permanently successful till they are fully related with the larger movement, the movement toward the determination of world-standards.

It has been necessary to limit this discussion by taking account only of higher and professional education. The movements of the time, however, relate as well to education of secondary and elementary grade, and some of their most interesting results may be looked for on those lower and broader fields. But as professional and higher instruction must in some measure determine the bounds of all instruction, it is natural that, as an international question, we should have first to do with standards in these departments of teaching. The bachelor's degree, the doctorate in philosophy and science, and the certificate of competence to practise medicine, are pivotal points as regards the international question.

The devising of practical procedure in this matter will call for serious consideration. With reference to such procedure, I beg to offer, in closing, the following suggestions:

On its academic side the standards-problem must be wrought out in this country chiefly by concerted action of the institutions concerned. It is of the utmost consequence that these institutions should find ways of working together, and avoid the danger of working at cross-purposes. The National Government has to do with the matter directly as an international question. Whatever diplomatic representations may be made in the matter from time to time must, of course, pass through the Department of State, and in these matters that Department acts ordinarily in consultation with the Department of the Interior. The Bureau of Education accordingly, for the Department of the Interior, forms the connection between the Government and the academic bodies which are concerned with the formulation of our American standards. It seems desirable that a consultative council for higher and professional education should be attached to the Bureau of Education, with a view to the effective handling of this and related questions, and that competent specialists should be employed on the staff of that office to deal with such questions. Direct conference between the educational bodies and educational leaders of this country and those of foreign countries, touching agreement concerning educational requirements and credentials, becomes increasingly desirable. Within the next few years it is to be hoped that such conferences may be frequently held. It should be a part of the program of American education to further the holding of such international conferences, and to bear our fair part in the proceedings of such conferences.

ELMER ELLSWORTH BROWN.

THE GEOGRAPHICAL DISTRIBUTION OF THE STUDENT BODY AT A NUMBER OF UNIVERSITIES AND COLLEGES

THE accompanying table explains the geographical distribution of the student body of twenty-one American universities, five New England colleges for men, five colleges for women, two technological schools and one Pennsylvania college and engineering school for men, for the academic year 1908–9, the summer session students being in every case omitted. *Indiana, Iowa, Johns Hopkins, Kansas, Nebraska, Northwestern* and *Stanford* have been added to the list, and the institutions have been separated into groups as they were last year.

Comparing the attendance by divisions of the six eastern universities (*Columbia, Cornell, Harvard, Pennsylvania, Princeton, Yale*) with the corresponding figures for the same universities in a similar table

1908–1909.	California.	Columbia.	Cornell.	Harvard.	Illinois.	Indiana.	Iowa.	Johns Hopkins.	Kansas.	Michigan.	Minnesota.	Missouri.	Nebraska.	North-western.	Ohio State.	Pennsyl-vania.	Princeton.	Stanford.	Virginia.	Wisconsin.	Yale.	Amherst.	Bowdoin.	Dartmouth.	Lehigh.	Mass. Inst. of Tech.	Purdue.	Wesleyan.	Williams.	Bryn Mawr.	Mt. Holyoke.	Smith.	Vassar.	Wellesley.
North Atlantic Div.	*14*	*3807*	*2855*	*3340*	*66*	*11*	*10*	*136*	*5*	*620*	*6*	*46*	*5*	*71*	*72*	*3561*	*925*	*40*	*36*	*58*	*2449*	*419*	*335*	*1067*	*559*	*1116*	*95*	*295*	*376*	*256*	*668*	*1129*	*678*	*931*
Connecticut	.....	86	48	58	1	1	.....	18	.....	12	.....	4	.....	5	2	45	12	1	4	3	1180	24	2	29	6	31	1	96	19	6	101	107	52	47
Maine	1	26	10	93	.....	.....	1	5	.....	9	.....	.....	.....	1	1	20	1	2	.....	3	16	4	254	42	1	22	.....	14	10	1	29	47	5	40
Massachusetts	3	89	109	2320	13	2	.....	14	.....	25	1	7	1	4	4	67	25	2	2	3	207	151	49	529	14	839	2	37	95	17	280	380	98	386
New Hampshire	.....	13	8	79	2	.....	.....	3	.....	5	.....	1	.....	1	2	10	3	.....	6	.....	17	3	14	232	.....	24	.....	2	1	3	28	33	11	35
New Jersey	1	458	201	60	2	.....	1	8	1	10	.....	.....	.....	4	3	300	264	3	.....	6	125	30	.....	17	68	14	18	42	42	15	41	114	68	92
New York	6	2990	2099	459	34	4	8	40	3	391	4	28	1	41	31	205	325	23	13	28	640	169	11	111	54	99	35	71	187	58	133	319	339	168
Pennsylvania	3	125	360	172	12	4	.....	45	1	148	1	5	3	15	27	2900	285	6	11	12	211	22	.....	15	416	53	38	29	12	152	29	85	97	128
Rhode Island	.....	11	6	71	1	.....	.....	1	.....	6	.....	.....	.....	.....	.....	9	8	1	.....	2	30	6	4	10	.....	28	.....	.....	3	4	12	19	3	22
Vermont	.....	9	14	28	1	.....	.....	2	.....	14	.....	1	.....	.....	2	5	2	2	.....	1	23	10	1	82	.....	6	1	4	7	.....	15	25	5	13
South Atlantic Div.	*6*	*152*	*229*	*129*	*20*	*5*	*5*	*401*	*3*	*81*	.....	*11*	*1*	*14*	*30*	*190*	*125*	*9*	*550*	*19*	*117*	*14*	*2*	*12*	*76*	*51*	*8*	*11*	*6*	*41*	*9*	*29*	*17*	*25*
Delaware	.....	9	15	5	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	51	20	.....	1	.....	14	.....	.....	1	3	.....	1	.....	.....	1	2	3	3	1
Dist. of Columbia	2	12	47	32	4	1	.....	7	1	36	.....	1	.....	1	2	23	22	6	6	8	21	6	2	6	13	10	4	5	2	6	2	7	3	9
Florida	.....	7	1	2	2	2	.....	2	1	5	.....	2	.....	.....	.....	9	5	.....	19	.....	11	2	.....	1	.....	6	1	.....	.....	1	.....	2	.....	1
Georgia	.....	27	14	18	3	.....	.....	15	.....	7	.....	2	1	1	3	13	1	.....	13	2	19	.....	.....	.....	.....	3	1	1	1	1	.....	3	3	5
Maryland	1	22	89	26	4	.....	1	309	.....	9	.....	.....	.....	1	3	44	49	2	23	2	14	5	.....	3	46	17	1	2	1	23	1	8	2	2
North Carolina	.....	23	18	14	2	.....	.....	13	.....	2	.....	.....	.....	4	.....	16	7	1	18	.....	9	.....	.....	.....	5	1	.....	.....	1	3	2	3	1	4
South Carolina	1	17	7	12	1	.....	1	17	.....	5	.....	1	.....	.....	1	7	7	.....	11	4	4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....
Virginia	2	25	29	11	4	.....	3	30	1	6	.....	2	.....	4	5	19	10	.....	442	.....	12	.....	.....	.....	7	11	.....	.....	1	6	2	1	4	2
West Virginia	.....	10	9	9	.....	2	.....	6	.....	11	.....	3	.....	3	16	8	4	.....	17	3	13	1	.....	1	2	3	.....	3	.....	.....	.....	1	1	1
South Central Division.	*11*	*90*	*88*	*91*	*58*	*9*	*7*	*54*	*47*	*90*	*5*	*72*	*12*	*52*	*25*	*56*	*52*	*14*	*140*	*24*	*88*	*5*	*1*	*7*	*9*	*39*	*74*	*4*	.....	*17*	*1*	*18*	*37*	*36*
Alabama	.....	17	8	12	4	.....	1	12	.....	11	.....	2	.....	4	.....	15	6	.....	29	1	7	1	1	.....	1	3	1	.....	.....	1	.....	2	3	1
Arkansas	.....	7	10	3	6	.....	.....	4	1	8	.....	18	2	3	4	5	3	1	10	2	3	.....	.....	1	.....	1	6	.....	.....	3	.....	3	8	2
Kentucky	1	14	11	24	18	6	2	8	2	33	1	5	1	4	7	8	14	6	39	5	22	1	.....	4	1	4	44	1	.....	2	1	4	8	23
Louisiana	1	7	10	3	4	.....	.....	4	.....	2	.....	.....	1	4	1	4	2	.....	5	1	14	.....	.....	.....	.....	3	.....	1	.....	2	.....	.....	.....	.....
Mississippi	.....	4	10	5	6	.....	1	3	.....	2	.....	3	.....	4	4	3	4	.....	15	2	4	.....	.....	.....	2	3	3	.....	.....	2	.....	.....	1	1
Oklahoma	2	7	4	8	10	.....	.....	.....	41	13	2	26	5	13	1	.....	.....	3	1	6	2	.....	.....	.....	.....	1	2	.....	.....	1	.....	.....	1	1
Tennessee	1	9	14	21	4	3	1	3	.....	9	.....	9	1	10	2	9	16	2	22	2	18	3	.....	.....	2	8	7	2	.....	2	.....	4	10	4
Texas	6	25	21	15	6	.....	2	20	3	12	2	9	2	10	6	12	7	2	19	5	18	.....	.....	2	3	16	11	.....	.....	4	.....	5	6	4
North Central Div.	*49*	*398*	*521*	*502*	*4012*	*1772*	*2138*	*76*	*2126*	*3650*	*4499*	*2162*	*3311*	*3078*	*2356*	*186*	*162*	*108*	*33*	*3689*	*565*	*64*	*4*	*127*	*15*	*121*	*1716*	*8*	*90*	*80*	*60*	*333*	*243*	*237*
Illinois	8	57	136	90	3448	28	30	14	3	258	14	67	7	1945	7	20	40	22	3	265	137	19	1	61	3	23	54	1	37	36	13	119	51	55
Indiana	6	55	38	44	132	1707	4	9	1	166	9	14	.....	154	17	29	18	16	3	38	25	1	.....	5	1	9	1479	2	4	8	3	17	17	11
Iowa	7	24	24	47	83	2	2017	5	5	77	42	25	64	267	6	21	8	23	.....	104	33	2	.....	8	.....	14	14	.....	4	4	8	19	15	23
Kansas	2	23	14	19	26	1	5	6	1994	36	1	44	24	78	4	6	1	5	2	11	22	.....	.....	2	.....	4	3	.....	.....	1	2	12	5	10
Michigan	3	35	40	22	41	2	3	1	1	2527	2	6	2	83	14	10	10	1	4	27	35	4	1	8	.....	7	20	1	2	3	10	23	32	23
Minnesota	8	35	18	33	29	2	14	2	.....	35	4223	2	1	90	3	14	13	6	2	36	46	2	.....	10	2	8	7	.....	16	4	3	38	17	21
Missouri	4	33	34	57	60	2	14	10	114	57	.....	1981	9	66	.....	14	17	10	13	14	58	7	.....	2	1	6	11	.....	3	3	.....	21	16	15
Nebraska	2	16	8	12	27	.....	10	3	4	25	.....	5	3177	51	1	2	5	5	1	12	15	7	1	2	.....	2	7	.....	1	5	1	8	4	15
North Dakota	1	9	6	10	16	.....	6	.....	.....	10	78	.....	4	26	1	2	2	1	.....	18	6	.....	.....	2	1	3	.....	.....	.....	.....	1	3	5	1
Ohio	1	86	168	135	49	28	1	19	3	381	3	13	2	77	2297	55	41	10	3	25	165	20	.....	25	6	30	108	3	16	12	14	53	54	45
South Dakota	.....	1	6	9	27	.....	26	1	1	31	57	1	19	66	.....	.....	1	3	1	40	5	.....	1	.....	.....	3	7	.....	.....	.....	.....	1	1	1	5
Wisconsin	7	24	29	24	74	.....	8	6	.....	47	70	4	2	175	6	13	6	6	1	3099	18	2	.....	2	1	12	6	1	7	4	4	19	26	13
Western Division	*3273*	*124*	*95*	*144*	*67*	*2*	*20*	*29*	*20*	*200*	*21*	*57*	*36*	*149*	*10*	*52*	*37*	*1458*	*18*	*56*	*120*	*18*	*4*	*18*	*5*	*53*	*18*	.....	*10*	*12*	*3*	*52*	*35*	*42*
Arizona	6	2	1	1	3	.....	.....	.....	.....	8	1	5	.....	4	.....	.....	.....	.....	9	1	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	2	.....
California	3178	41	23	67	12	.....	.....	14	1	32	5	9	1	28	2	12	5	1318	8	7	39	1	1	4	.....	20	4	.....	1	5	2	11	11	11
Colorado	6	15	16	26	15	.....	7	.....	12	43	1	15	10	18	3	8	11	18	4	10	30	1	2	10	1	5	7	.....	5	2	.....	14	11	13
Idaho	7	1	1	1	7	1	4	.....	.....	11	8	4	3	7	.....	4	1	5	.....	6	1	.....	.....	1	.....	1	.....	.....	.....	.....	.....	1	.....	1
Montana	4	14	14	7	5	.....	3	1	.....	36	.....	8	2	24	1	.....	6	8	1	14	6	3	.....	.....	1	2	1	.....	.....	1	1	3	2	3
Nevada	9	1	.....	1	.....	.....	.....	.....	.....	1	.....	1	.....	.....	1	1	.....	12	.....	.....	.....	.....	.....	.....	.....	1	1	.....	.....	1	.....	.....	.....	2
New Mexico	4	2	.....	1	2	1	.....	1	3	4	.....	5	.....	4	2	.....	1	2	.....	2	2	1	.....	.....	1	1	.....	.....	.....	.....	.....	.....	1	.....
Oregon	33	17	12	12	2	.....	2	3	1	18	.....	1	1	7	.....	2	3	28	1	3	12	7	.....	.....	.....	4	.....	2	2	.....	5	.....	.....	2
Utah	2	8	15	8	7	.....	2	.....	3	10	.....	5	.....	22	.....	13	4	14	1	2	7	2	.....	.....	2	5	1	.....	.....	.....	.....	4	1	2
Washington	23	22	11	16	14	.....	2	9	.....	28	6	2	4	29	1	12	5	42	1	9	20	3	1	3	.....	13	4	.....	2	.....	.....	12	5	7
Wyoming	1	1	2	4	.....	.....	.....	1	.....	9	.....	2	15	6	.....	.....	1	2	1	3	1	.....	.....	.....	.....	1	.....	.....	.....	1	.....	1	2	1
Insular and Non-contiguous Ter.	*21*	*13*	*34*	*14*	*15*	.....	*4*	*1*	.....	*10*	.....	*3*	*7*	*8*	*8*	*15*	.....	*12*	*2*	*11*	*14*	.....	.....	.....	*1*	*9*	*4*	.....	.....	*1*	.....	*1*	.....	*4*
Alaska	3	.....	1	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	1	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1
Canal Zone	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....
Hawaiian Islands	14	3	5	8	.....	.....	.....	.....	.....	1	.....	1	.....	.....	.....	.....	.....	12	.....	1	5	.....	.....	.....	.....	1	.....	.....	.....	1	.....	.....	.....	2
Philippine Islands	4	6	12	1	13	.....	4	1	.....	3	.....	2	7	6	5	1	.....	.....	.....	8	6	.....	.....	.....	.....	1	4	.....	.....	.....	.....	1	.....	.....
Porto Rico	.....	4	16	4	2	.....	.....	.....	.....	6	.....	.....	.....	1	3	12	.....	.....	2	1	2	.....	.....	.....	1	6	.....	.....	.....	.....	.....	.....	.....	1
Total	3374	4584	3822	4220	4238	1799	2184	697	2201	4651	4531	2351	3372	3372	2501	4060	1301	1641	779	3857	3353	520	346	1231	665	1389	1915	318	482	407	741	1562	1010	1275

B—FOREIGN COUNTRIES

1908–1909.	California.	Columbia.	Cornell.	Harvard.	Illinois.	Indiana.	Iowa.	Johns Hopkins.	Kansas.	Michigan.	Minnesota.	Missouri.	Nebraska.	Northwestern.	Ohio State.	Pennsylvania.	Princeton.	Stanford.	Virginia.	Wisconsin.	Yale.	Amherst.	Bowdoin.	Dartmouth.	Lehigh.	Mass. Inst. of Tech.	Purdue.	Wesleyan.	Williams.	Bryn Mawr.	Mt. Holyoke.	Smith.	Vassar.	Wellesley.
North America	5	59	47	45	12	1	4	12	2	33	5	10	.....	30	11	64	6	6	.....	17	24	.....	.....	1	12	29	10	2	1	3	1	2	3	3
Canada	3	31	10	35	5	1	2	12	1	25	5	3	.....	24	1	17	4	4	.....	8	21	.....	.....	.....	1	15	2	2	.....	3	.....	1	3	3
Central America	.....	5	7	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	16	.....	.....	.....	1	.....	.....	.....	.....	2	5	1	.....	.....	.....	.....	.....	.....	.....
Cuba	.....	14	19	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	5	15	1	.....	.....	1	1	.....	.....	.....	4	2	3	.....	.....	.....	.....	.....	.....	.....
Mexico	2	6	10	2	6	.....	2	.....	1	6	.....	7	.....	2	4	8	.....	1	.....	6	2	.....	.....	1	4	6	2	.....	1	.....	1	1	.....	.....
Newfoundland	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
West Indies	.....	3	1	3	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	6	1	1	.....	1	.....	.....	.....	.....	1	1	2	.....	.....	.....	.....	.....	.....	.....
South America	6	11	33	5	7	.....	.....	2	.....	6	.....	6	.....	2	1	6	1	.....	.....	1	.....	.....	.....	.....	1	1	2	.....	.....	.....	.....	.....	.....	.....
Argentine Rep	4	2	12	2	5	.....	.....	.....	.....	.....	.....	1	.....	2	8	7	.....	.....	.....	1	1	1	.....	.....	2	2	1	1	.....	.....	.....	.....	.....	.....
Bolivia	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Brazil	.....	.....	5	1	1	.....	.....	2	.....	1	.....	.....	.....	.....	.....	15	1	.....	.....	.....	.....	.....	.....	.....	.....	3	.....	.....	.....	.....	.....	.....	.....	.....
British Guiana	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Chili	1	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....
Colombia	.....	3	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....
Ecuador	1	3	5	.....	.....	.....	.....	.....	.....	4	.....	.....	.....	.....	.....	5	.....	.....	1	.....	.....	.....	.....	.....	3	2	.....	.....	.....	.....	.....	.....	.....	.....
Paraguay	.....	.....	5	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....
Peru	.....	1	5	1	1	.....	.....	.....	.....	.....	.....	3	.....	.....	2	2	.....	.....	1	1	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....
Uruguay	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....
Europe	13	53	20	47	14	1	.....	4	4	12	4	10	2	16	3	55	2	3	.....	8	18	1	1	1	.....	8	1	1	.....	7	3	.....	1	.....
Austria-Hungary	.....	3	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	2	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Belgium	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Bulgaria	.....	.....	1	2	.....	.....	.....	.....	1	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Denmark	2	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
France	.....	4	2	6	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	6	.....	.....	.....	.....	2	1	.....	1	.....	.....	.....	.....	.....	1	.....	.....	1	.....
Germany	4	8	1	12	1	.....	.....	1	.....	7	.....	.....	2	3	.....	15	.....	.....	.....	.....	2	.....	.....	.....	.....	4	.....	.....	.....	6	.....	.....	.....	.....
Gt. Britain and Ir'd.	3	13	3	15	1	.....	.....	.....	.....	1	.....	2	.....	3	.....	7	2	1	.....	5	4	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Greece	.....	1	1	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....
Holland	1	1	2	1	.....	.....	.....	.....	1	1	.....	.....	.....	.....	.....	7	.....	1	.....	.....	1	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....
Italy	.....	1	.....	3	1	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	3	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	1	.....	.....	.....	.....	.....	.....
Norway	1	.....	1	.....	2	1	.....	.....	.....	.....	1	.....	.....	2	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Portugal	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Rumania	.....	.....	.....	1	1	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Russia	1	11	2	6	2	.....	.....	.....	2	2	2	5	.....	.....	3	9	.....	.....	.....	2	1	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....
Spain	.....	2	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Sweden	.....	2	2	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	3	.....	1	.....	.....	.....	1	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Switzerland	.....	4	2	1	1	.....	.....	.....	.....	1	1	1	.....	.....	.....	1	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Turkey	1	3	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	4	.....	.....	.....	.....	1	.....	.....	.....	3	.....	.....	.....	.....
Asia	46	42	50	43	29	7	11	.....	3	16	6	10	5	12	16	31	3	11	2	19	42	6	1	.....	8	18	6	.....	4	3	3	1	.....	4
Ceylon	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
China	17	12	33	25	9	3	1	.....	.....	6	.....	5	.....	1	2	22	.....	2	2	10	21	.....	.....	.....	7	10	3	.....	.....	.....	.....	.....	.....	.....
Corea	1	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	2
India	9	3	6	6	5	.....	1	.....	.....	2	.....	1	1	3	8	.....	.....	3	.....	1	2	3	1	.....	1	2	.....	.....	.....	.....	.....	.....	.....	.....
Japan	18	23	10	8	11	3	9	.....	.....	5	6	4	3	1	2	8	1	6	.....	8	15	3	.....	.....	.....	4	3	.....	2	2	1	1	.....	1
Persia	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	1
Siam	1	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Straits Settlements	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Turkey	.....	3	1	2	4	1	.....	.....	3	3	.....	.....	.....	6	3	1	1	.....	.....	.....	4	.....	.....	.....	.....	2	.....	.....	1	1	.....	.....	.....	.....
Africa	1	.....	2	4	.....	.....	.....	.....	.....	1	1	.....	.....	1	.....	2	1	.....	.....	.....	.....	.....	.....	.....	.....	5	.....	.....	.....	.....	.....	.....	.....	.....
Egypt	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	2	1	.....	.....	.....	.....	.....	.....	.....	.....	2	.....	.....	.....	.....	.....	.....	.....	.....
Madagascar	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
South Africa	1	.....	2	2	.....	.....	.....	.....	.....	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Australasia	5	1	5	3	.....	.....	.....	.....	.....	1	.....	.....	.....	10	.....	35	.....	4	.....	.....	.....	.....	.....	.....	.....	3	.....	.....	.....	.....	.....	.....	.....	.....
Australia	3	1	5	1	.....	.....	.....	.....	.....	.....	.....	.....	.....	9	.....	20	.....	4	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Caroline Islands	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
New Zealand	2	.....	.....	2	.....	.....	.....	.....	.....	1	.....	.....	.....	1	.....	15	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total (For. countries)	76	166	157	147	62	9	15	18	9	69	16	36	7	71	40	225	13	24	4	46	86	8	2	2	25	72	19	4	5	13	7	3	4	7
Total (United States)	3374	4584	3822	4220	4238	1798	2184	697	2201	4651	4531	2351	3372	3372	2501	4060	1301	1641	779	3857	3353	520	346	1231	665	1389	1915	318	482	407	741	1562	1010	1275
Grand total	3450	4750	3979	4367	4300	1807	2199	715	2210	4720	4547	2387	3379	3443	2541	4285	1314	1665	783	3903	3439	528	348	1233	690	1461	1934	322	487	420	748	1565	1014	1282

published in SCIENCE,[1] we note that there has been a gain for these universities, taken as a whole, in every division except one, namely, the South Central, which in 1908 exhibited an increase of 36 students. The largest increase by far was naturally recorded in the North Atlantic division, which was followed by the South Atlantic with an increase of 67 students, the North Central with a gain of 52, the Western with one of 39, and the insular and non-contiguous territories with one of 21. Foreign countries show an increase of only 11 over last year, while the South Central division has lost 44 students. The total increase in divisions outside of the North Atlantic was only 135 as against 381 last year, 189 in 1907 and 91 in 1906. So far as the gain in foreign patronage is concerned, this year's increase of 11 compares rather unfavorably with that of 92 in 1908, 64 in 1907 and 87 in 1906. Calculated on a percentage basis, the total gain of the six universities in the North Atlantic division during the past year amounted to 5.17 per cent., as against a gain of 2.89 per cent. outside of the division mentioned. This is the first time in several years that the percentage of increase has been larger in the North Atlantic division than outside of it, the total gain in the North Atlantic division in 1908 having been 2.30 per cent., as against an increase of 8.16 per cent. outside of the division mentioned, and in 1907 3.51 per cent. as against 5.73 per cent. In the South Atlantic division all of these institutions with the exception of *Harvard* show gains; in the insular and non-contiguous territories all with the exception of *Princeton* have experienced an increase; in the western division all show a small increase; in the North Central division the gains of *Columbia* and *Cornell* outweigh the losses of the other four, while in foreign countries the gains of *Cornell, Harvard* and *Pennsylvania* more than compensate for the losses of the three remaining institutions; *Princeton* alone shows a gain in the South Central division.

Comparing these figures with those of 1905, we observe that the most substantial gains have been made by *Cornell* (140), *Columbia* (136) and *Yale* (59) in the North Central division; by *Cornell* (54), *Pennsylvania* (43), *Princeton* (38) and *Columbia* (34) in the South Atlantic division; by *Columbia* (18) in the South Central division, and by *Pennsylvania* (99), *Cornell* (57), *Harvard* (53) and *Columbia* (49) in foreign countries.

Taking the universities in the accompanying table by divisions, we find that *Harvard* has been passed in the North Atlantic division by both *Columbia* and *Pennsylvania, Cornell, Yale* and *Princeton* following in the order named. Of the western institutions, *Michigan* has by far the strongest hold on this division, attracting 620 students (as against 394 in 1905) to *Ohio's* 72, *Northwestern's* 71, *Illinois's* 66 and *Wisconsin's* 58. All of the western institutions included in both this year's and last year's tables show an increase in their clientele from this division with the exception of *Ohio* and *Wisconsin, Virginia* also showing a loss. *Harvard,* as usual, leads in all of the New England states, with the natural exception of Connecticut, where *Yale* has the largest following. *Columbia,* of course, has a considerable lead in New York and New Jersey, both *Columbia* and *Pennsylvania* drawing more students from that state than *Princeton* does, although it must be remembered that the professional schools give the two first-mentioned institutions an advantage over *Princeton. Columbia* is followed in New

[1] N. S., Vol. XXVIII., No. 722, October 30, 1908, pp. 577–585.

York state by *Cornell, Yale, Harvard, Princeton, Pennsylvania,* although *Michigan* attracts more students from the Empire state (391, as against 195 in 1905) than *Princeton* or *Pennsylvania.* In New Jersey *Columbia* is followed by *Pennsylvania, Princeton, Cornell, Yale, Harvard. Pennsylvania* naturally leads in its own state, being followed by *Cornell, Princeton, Yale, Harvard, Columbia,* this order being identical with that of 1908.

Examining next the attendance of the group of men's colleges and technological schools, we note that the order for the entire division is *Massachusetts Institute of Technology, Dartmouth, Lehigh, Amherst, Williams, Bowdoin, Wesleyan—Purdue* naturally bringing up the rear. All of the institutions in this group show an increase in their representation from the North Atlantic states as compared with 1908. In New York state the order for the colleges remains unchanged, namely, *Williams, Amherst, Dartmouth, Massachusetts Institute of Technology, Wesleyan, Lehigh, Bowdoin.* Of the six New England institutions included in both the 1908 and 1909 tables, 29 per cent. of the students of *Amherst* as against 43 per cent. in 1906 have their permanent home in Massachusetts; *Bowdoin* draws 73 per cent. of its student body from Maine, as against 77 per cent. last year; 19 per cent. of *Dartmouth's* students, as against 24 per cent. in 1906 come from New Hampshire (25 per cent. as against 21 per cent. in 1906 from New Hampshire and Vermont); *Massachusetts Institute of Technology* drew 57 per cent. of its student body from Massachusetts, as against 55 per cent. last year, this being the sole instance of an increase in the percentage of patronage from the home state; 30 per cent. of *Wesleyan's* students, as against 35 per cent. last year, claim Connecticut as their permanent home, while *Williams* continues to enroll 20 per cent. of its student body from Massachusetts. *Williams* draws more than twice as many students from New York as from Massachusetts, *Amherst* also attracts more from the Empire state than from Massachusetts, and *Dartmouth* attracts more than twice as many from Massachusetts as from New Hampshire. 60 per cent. of *Lehigh's* student body hails from Pennsylvania, as against 58 per cent. in 1908 and 1907 and 60 per cent. in 1906, while 76 per cent. of *Purdue's* students claim Indiana as their permanent residence, this figure having remained stationary since 1908. It is thus seen that of the institutions included in this group *Dartmouth* attracts the largest percentage of students from outside of its own state, followed by *Williams, Amherst, Wesleyan, Massachusetts Institute of Technology, Lehigh, Purdue* and *Bowdoin.*

Of the eastern universities, *Pennsylvania* still possesses the largest percentage of enrolment from its own state, namely, 68 per cent., as against 67 per cent. in 1906; of *Columbia's* student body 63 per cent. come from New York state, as against 66 per cent. in 1906 and only 45 per cent. in the 1909 summer session; *Cornell's* percentage of New York students has dropped from 56 per cent. in 1906 to 53 per cent. in 1909; of *Harvard's* students 53 per cent., as against 54 per cent. in 1906, are residents of Massachusetts; of *Yale's* students 34 per cent., as against 33 per cent. in 1906, have their permanent residence in Connecticut, and of *Princeton's* students only 20 per cent., the same as in 1906, are residents of the state of New Jersey. In no individual case do these figures differ more than one per cent. as compared with last year, while compared with 1906 *Columbia* and *Cornell* have each increased their outside patronage by three per cent.,

Harvard has increased it by one per cent., *Princeton* has remained uniform, while the outside clientele of *Pennsylvania* and *Yale* has been lowered one per cent. since 1906. Of the other eastern universities included in the table *Virginia* draws 56 per cent. of its student body from its own state as against 53 per cent. in 1908, while *Johns Hopkins* attracts 43 per cent. of its students from Maryland.

Coming to the South Atlantic division and taking into consideration only the six eastern universities, we note that the order has not changed for the last three years, it being *Cornell, Pennsylvania, Columbia, Harvard, Princeton, Yale,* although *Johns Hopkins* and *Virginia* naturally have a larger following in this section than any of the northern institutions, and yet *Columbia* draws more students from North Carolina, South Carolina and Georgia than *Virginia* does. *Chicago* and *Michigan* are the only western institutions to make a fair showing in this group of states, while *Lehigh, Massachusetts Institute of Technology* and *Bryn Mawr* are the only colleges with a good representation from this division, their main strength lying in Maryland. So far as the individual states are concerned, *Pennsylvania* naturally leads in Delaware and *Johns Hopkins* in Maryland; *Cornell* leads in the District of Columbia, *Virginia* in Florida, its own state and West Virginia, and *Columbia* in Georgia and North Carolina, tying with *Johns Hopkins* in South Carolina. *Johns Hopkins* is second in Virginia, followed by *Cornell* and *Columbia.* Leaving the state of Virginia out of consideration and omitting *Johns Hopkins* on account of its large Maryland clientele, we note that all of the remaining six eastern universities with the exception of *Yale* have a larger following in the South Atlantic division than *Virginia.*

In the South Central division *Virginia* heads the list, followed by *Harvard* (91, as against 80 in 1905), *Columbia* (90–72) and *Michigan* (90–64), *Cornell* (88–76) and *Yale* (88–80), *Missouri, Illinois, Pennsylvania* (56–44), *Johns Hopkins, Northwestern* and *Princeton* (52–72). *Michigan* and *Columbia* have made the largest gains in this division, while *Princeton* shows a decrease since 1905. With the exception of *Massachusetts Institute of Technology,* the New England colleges have only a small following in this group of states. *Smith, Vassar* and *Wellesley* make a far better showing in both divisions than *Amherst, Bowdoin, Dartmouth, Wesleyan* or *Williams,* as they do in the North Central division. Indeed, the girls' colleges have a much less local attendance than the New England colleges for men, this being conclusively demonstrated by the following figures: From the three divisions just mentioned *Smith* draws altogether 380 students, *Wellesley* 298 and *Vassar* 297, as against 146 for *Dartmouth,* 96 for *Williams,* 83 for *Amherst,* only 23 for *Wesleyan* and only 7 for *Bowdoin. Bryn Mawr* attracts 138 of its students from the same section and *Massachusetts Institute of Technology* 211. *Smith* draws 119 students from the state of Illinois alone, more than *Amherst, Bowdoin* and *Wesleyan* combined do from the three divisions under discussion. *Barnard* college, on the other hand, has only 14 students from these three divisions. The largest representation from the individual states is found at the following universities: Alabama—*Virginia, Columbia, Pennsylvania;* Arkansas—*Missouri, Cornell* and *Virginia;* Kentucky—*Virginia, Michigan, Harvard;* Louisiana—*Yale, Cornell, Columbia;* Mississippi—*Virginia, Cornell, Illinois;* Oklahoma—*Kansas, Missouri, Northwestern;* Tennessee—*Virginia, Harvard, Yale;* and Texas—*Columbia, Cornell, Johns Hopkins.*

In the North Central division the order for the institutions located in that region is *Minnesota, Illinois, Wisconsin, Michigan, Nebraska, Northwestern, Ohio State, Missouri, Iowa, Kansas, Indiana, Purdue.* All of these, naturally, have a larger patronage in this division than any of the eastern universities, which come in the order *Yale, Cornell, Harvard, Columbia, Pennsylvania, Princeton, Johns Hopkins, Virginia—Cornell* and *Harvard* having exchanged places since last year. At the prominent universities of the middle west, the percentage of attendance from outside of the state in which the institution is located is, with the exception of *Chicago, Michigan* and *Northwestern,* much lower than it is in the case of the eastern institutions. The figures for percentage of enrolment from the home state are as follows: *Michigan* 54 per cent., *Northwestern* 56 per cent., *Wisconsin* 79 per cent., *Illinois* 80 per cent., *Missouri* 83 per cent., *Kansas* and *Ohio State* 90 per cent. each, *Iowa* 91 per cent., *Minnesota* 93 per cent., *Indiana* 94 per cent. and *Nebraska* 95 per cent. Of the two large universities on the Pacific coast *Stanford* is much less local in its student patronage than the *University of California,* the figures being 79 per cent. and 93 per cent., respectively. The largest gains (30 or more) in individual states since 1905 have been made in Illinois by *Columbia* and in Ohio by *Cornell* and *Yale. Columbia's* representation in this group of states has grown from 262 to 398 in four years, *Cornell's* from 381 to 521, *Yale's* from 506 to 595, *Pennsylvania's* from 139 to 186, while *Harvard's* has dropped from 526 to 502, and *Princeton's* from 209 to 162. Of the New England colleges for men, *Dartmouth* (127) has outgrown *Massachusetts Institute of Technology* (121) since last year in the size of its clientele from this division, *Williams* being third (90) and *Amherst* fourth (64), while the order for the girls' colleges is *Smith, Vassar, Wellesley, Bryn Mawr, Mt. Holyoke.* The first three of the girls' colleges mentioned have a much larger clientele from this division than either *Pennsylvania* or *Princeton.* The representation of *Amherst* in these states has grown from 43 to 64 in three years, that of *Dartmouth* from 91 to 127 and that of *Williams* from 86 to 90. Leaving the state institution or institutions out of consideration in each case, *Wisconsin* is seen to have the largest following in Illinois, having passed *Michigan* since last year, *Yale, Cornell, Smith* and *Harvard* following. *Michigan* retains its lead in Indiana, and is followed in that state by *Northwestern, Illinois, Columbia, Harvard, Cornell* and *Wisconsin.* In Iowa the order is *Northwestern, Wisconsin, Illinois, Michigan, Nebraska, Harvard;* in Kansas *—Northwestern, Missouri, Michigan, Illinois, Nebraska, Columbia;* in Michigan—*Northwestern, Illinois, Cornell, Columbia* and *Yale, Vassar;* in Minnesota—*Northwestern, Yale, Smith, Wisconsin, Columbia* and *Michigan;* in Missouri—*Kansas, Northwestern, Illinois, Yale, Harvard* and *Michigan;* in Nebraska—*Northwestern, Illinois, Michigan, Columbia, Yale* and *Wellesley;* in North Dakota—*Minnesota, Northwestern, Wisconsin, Illinois, Harvard* and *Michigan;* in Ohio—*Michigan, Cornell, Yale, Harvard, Purdue, Columbia;* in South Dakota—*Northwestern, Minnesota, Wisconsin, Michigan, Illinois, Iowa;* in Wisconsin—*Northwestern, Illinois, Minnesota, Michigan, Cornell, Vassar —Northwestern* being mentioned first in seven of the 12 states included in this division.

In the western division (leaving *California* and *Stanford* out of consideration) *Michigan* is still in the lead, with *North-*

western, Harvard, Columbia and *Yale,* each of which attracts over one hundred students from this section, following; then come *Cornell, Illinois, Missouri, Wisconsin, Massachusetts Institute of Technology, Pennsylvania* and *Smith,* the remaining institutions all drawing less than fifty students from this division. *Michigan's* representation has grown from 134 to 200 since 1905; *Harvard's* from 126 to 144; *Columbia's* from 111 to 124; *Yale's* from 78 to 115; *Cornell's* from 76 to 95; *Illinois's* from 41 to 67; *Pennsylvania's* from 22 to 52; while *Princeton's* has dropped from 41 to 37. *Michigan* leads in Arizona, Colorado, Idaho, Montana and Oregon; *Harvard* in California, *Missouri* in New Mexico, *Northwestern* in Utah and Washington and *Nebraska* in Wyoming. *Columbia* is second in California and Oregon, and *Michigan* in Washington.

Taking only the six eastern institutions mentioned at the beginning of the article into consideration and counting ties in fractions, we find that *Columbia* leads in $13\frac{5}{6}$ states, *Harvard* in $13\frac{1}{3}$, *Cornell* in $9\frac{1}{2}$, *Yale,* in 9, *Pennsylvania* in $3\frac{1}{3}$ and *Princeton* in none, as follows: *Columbia*—New Jersey, New York, Georgia, North Carolina, South Carolina, Alabama, Texas, Indiana, Kansas, Nebraska, Arizona ($\frac{1}{2}$), Montana ($\frac{1}{2}$), Nevada ($\frac{1}{3}$), New Mexico ($\frac{1}{2}$), Oregon, Washington; *Harvard* in Maine, Massachusetts, New Hampshire, Rhode Island, Vermont, Kentucky, Oklahoma, Tennessee, Iowa, North Dakota, South Dakota, California, Nevada ($\frac{1}{3}$), Wyoming; *Cornell* in the District of Columbia, Maryland, Virginia, Arkansas, Mississippi, Michigan, Ohio, Wisconsin, Montana ($\frac{1}{2}$), Utah; *Yale* in Connecticut, Florida, West Virginia, Louisiana, Illinois, Minnesota, Missouri, Arizona ($\frac{1}{2}$), Colorado, New Mexico ($\frac{1}{2}$); *Pennsylvania* in Pennsylvania, Delaware, Idaho, Nevada ($\frac{1}{3}$).

Cornell maintains its lead in the number of students from insular and non-contiguous territories, being followed by *Illinois* and *Pennsylvania. California* leads in Alaska and Hawaii, *Illinois* in the Philippines, *Cornell* in Porto Rico and *Pennsylvania* in the Canal Zone.

The number of foreign students at American institutions of learning is rapidly on the increase, and it is safe to say that the day is not very far distant when there will be more German students at American universities than American students at German universities. There were enrolled in 1909, 794 foreigners at the six eastern universities, as against 540 in 1905. Adding the foreign clientele of the other institutions in the table, we find that 34 American institutions attracted no less than 1,467 foreigners during the academic year 1908–9, this figure being, as all the other comparisons have been, exclusive of the summer session attendance. *Columbia* attracted no less than 42 foreigners to its current summer session, and no doubt several other universities can make a similarly good showing for the summer term. Taking the representation of foreigners at all of the institutions included in the table, it is found that the largest delegations are sent by the following countries: Canada 242, China 193, Japan 158, Mexico 81, Great Britain and Ireland 71, Cuba 70, India 60, Germany 56, Argentine Republic 52, Turkey 51 and Russia 50; China having passed Japan since last year, England having passed Cuba and India and Germany the Argentine Republic. 460 of the 1,467 foreigners hail from North America, 458 from Asia, 313 from Europe, only 154 from South America, 64 from Australasia and 18 from Africa.

Owing to the large delegation of foreigners in its dental school, *Pennsylvania* with 225 students from foreign countries continues to head the list, being followed by

Columbia 166, *Cornell* 157, *Harvard* 147, *Yale* 86, *Massachusetts Institute of Technology* 72, *Northwestern* 71 and *Michigan* 69. *Lehigh* with its 25 foreigners and *Purdue* with 19, make a far better showing than any of the New England colleges, while *Bryn Mawr, Mt. Holyoke, Smith, Vassar* and *Wellesley* have only 31 foreign students altogether, as against 21 at *Amherst, Bowdoin, Dartmouth, Wesleyan* and *Williams.*

Examining the foreign delegations of the different institutions by continents, we note that the order in North America is *Pennsylvania, Columbia, Cornell;* in South America—*Pennsylvania, Cornell, Massachusetts Institute of Technology;* in Europe—*Pennsylvania, Columbia, Harvard;* in Asia—*Cornell, California, Harvard;* and in Australasia—*Pennsylvania, Northwestern.* Of the countries that send at least ten students to any one institution *Harvard* leads in Canada and England; *Pennsylvania* in Central America, Brazil, Germany, Australia and New Zealand; *Cornell* in Cuba, Mexico, Argentine Republic and China; *Columbia* in Russia and Japan. As for individual countries the order for Canada is *Harvard, Columbia, Michigan, Northwestern, Yale;* for Cuba—*Cornell, Pennsylvania, Columbia;* for Mexico—*Cornell, Pennsylvania, Missouri;* for Germany—*Pennsylvania, Harvard, Columbia;* for England—*Harvard, Columbia, Pennsylvania;* for Russia—*Columbia, Pennsylvania, Harvard;* for China—*Cornell, Harvard, Pennsylvania, Yale;* for India—*California, Ohio State;* for Japan—*Columbia, California, Yale;* for Australia—*Pennsylvania, Northwestern.*

RUDOLF TOMBO, JR.
COLUMBIA UNIVERSITY

THE UNIFICATION OF THE METHODS OF ANALYSIS OF FATS AND OILS

THE International Commission for the Unification of the Methods of Analysis of Petroleum Products having been able to accomplish so much it was thought that a commission along similar lines to consider the analysis of fats and oils would be of equal value and the need for some work along this line is evident when we consider to what an extent oils and fats are bought and sold on chemical analysis.

In order to bring this about there have been organized in various scientific societies committees for this purpose. At the present time committees, or sections as they are called, have been formed in Germany, Italy, France, Sweden, Holland, Hungary, Switzerland and England. These committees or sections are for the purpose of making a study of the conditions existing in their own country preliminary to the organization of an International Commission.

The committee or section in this country is made up of three committees, one from the American Chemical Society, one from the American Society for Testing Materials and one from the Association of Official Agricultural Chemists, which united in forming what is known as the Joint Committee on the Unification of the Methods of Analysis of Fats and Oils.

The work of this section, or committee, is first to study the condition in this country preliminary to taking part in an international conference and this work the committee considers of the first importance. The committee has secured the active cooperation of the U. S. Bureau of Standards which will enable it to carry on its work under the most advantageous conditions as regards standardizing of necessary apparatus and chemicals and the preparation of tables and samples.

So far the work under way is, first, consideration of tables and methods of expression of specific gravity and consideration of standard temperature conditions.

Second, a consideration of the meaning of cold or cloud tests in oils and the collection of data as to methods used and their interpretation.

Third, a consideration of the proper method of expressing acidity in oils and fats.

Fourth, a consideration of the proper method of standardizing refractometers.

The committee is now engaged in the collection of information as to the practise in use by the chemists connected with the fat and oil industry of this country by means of letters sent to as large a number of chemists who would be interested in this work as possible. As soon as this information is collected it will be considered and if necessary cooperative work undertaken to decide on the most satisfactory method or mode of expression, and finally when this is done the committee will be in a position to make its recommendation. In order to prevent needless duplication of work in the various societies in this country, the committee is collecting data as to all the work being undertaken along this line and will try to assist in whatever way it can this work of bringing some order out of the present conditions in the analysis of fats and oils which are exceedingly unsatisfactory.

The committee expects, from time to time, to publish the results of its investigations and if thought advisable make recommendations. Any person desiring information regarding the work or information along these lines should address the secretary of the committee, C. N. Forrest, Maurer, N. J.

SCIENTIFIC NOTES AND NEWS

At the close of the second week of the celebration of the twentieth anniversary of Clark University, further honorary degrees were conferred as follows: doctorate of laws on Marston T. Bogert, professor of organic chemistry in Columbia University; Arthur Michael, the first professor of chemistry in Clark University, professor of chemistry in Tufts College; A. A. Noyes, professor of chemistry in the Massachusetts Institute of Technology; W. A. Noyes, professor of chemistry in the University of Illinois; the degree of doctor of chemistry on Theodore W. Richards, professor of chemistry in Harvard University; of doctor of science on André Debierne, of the University of Paris, and Julius Stieglitz, professor of chemistry in the University of Chicago.

The medical department of Stanford University, formed by amalgamation with Cooper Medical College, was formally opened on September 8. Dr. H. A. Christian, dean of the Harvard Medical School, made the principal address, the subject of which was "The Career in Medicine and Present-day Preparation for it." This address will be published in Science.

Professor J. Arthur Thompson, of the University of Aberdeen, is giving in South Africa under the auspices of the South African Association for the Advancement of Science a series of lectures in celebration of the Darwin centenary.

Mr. O. H. Tittman, chief of the U. S. Coast and Geodetic Survey, is the member for the United States of the permanent commission of the International Geodetic Association, the meeting of which was held in London beginning on September 21.

At the recent meeting of the International Otological Congress at Budapest, Professor Clarence John Blake, of Harvard University, was elected president of the next congress, to be held in 1912, in Boston.

An Illuminating Engineering Society has been founded in London, with Professor Sylvanus P. Thompson as the first president.

Professor Ralph S. Tarr, Cornell University, will spend the current year in Europe on sabbatical leave.

Professor H. F. Cleland, of Williams College, spent July and August in studying certain geological features of Wolff County, Ky., and of the Forest Reserve south of Flagstaff, Arizona. He also visited the Grand Canyon of Arizona, the Yosemite and Canadian Rockies.

Secretary Charles D. Walcott, of the Smithsonian Institution, has returned to Washington after a seven-weeks' trip in the higher Canadian Rockies to the north and south of the main line of the Canadian Pacific Railroad. In continuation there of his geological work in the main range of the Rocky Mountains Mr. Walcott found the base of the great Cambrian System in a fossil sea-beach that now forms a bed of white quartz pebble conglomerate some 300 feet in thickness. Below this, 4,000 feet of limestone of an older period were measured, and above it over 12,000

feet of Cambrian limestones, sandstones and shales, in which fossils were found at many horizons. Large collections of rocks and fossils have been sent to the United States National Museum.

THE expedition from the Peabody Museum of Harvard University to South America, under the patronage of Louis J. de Milhau, has returned. The past three years have been spent in explorations on the headwaters of the Amazon River in the interior of Peru and Bolivia. The primary object of the expedition was the study of the native tribes of these little known regions. Incidentally, collections were made in natural history, meteorological observations were taken, and topographical work was done. A map of the entire region, based on traverses and astronomical observations, was made for the Peruvian government. The field work of the expedition was done under the direction of Dr. William Curtis Farabee, assisted by Dr. E. F. Horr, Mr. L. J. de Milhau and Mr. J. W. Hastings.

MR. DELOS ARNOLD, donor of the Arnold Geological Collection of the department of geology, Stanford University, died at his home in Pasadena, California, on August 31.

MR. THOMAS SOUTHWELL, of Norwich, known for his work on ornithology and on whales, died on September 5, at the age of seventy-nine years.

AN International Congress of Radiology and Electricity will be held at Brussels in 1910. The congress is under the patronage of the Belgian government and the French Society of Physics.

THE third International Congress of School Hygiene, to be held in Paris, has been postponed until the first week of August, 1910.

THE ninth annual New England Intercollegiate Geological Excursion will be taken in the northern Berkshires, Saturday, October 9. A formal meeting will be held at the Wellington Hotel, Pittsfield, Mass., at eight o'clock Friday evening at which papers on the structural and glacial features and the anthropogeography of the region will be read and the outline of the excursion of the next day will be given. More detailed notices will be sent to all geologists and geographers who have attended former excursions and to others who will write to the secretary, Herdman F. Cleland, Williamstown, Mass.

THE public museum of the Staten Island Association of Arts and Sciences, in Borough Hall, New Brighton, should be added to the list of institutions in which commemorative Hudson-Fulton exhibits have been installed. This exhibit, which was opened with appropriate ceremonies on September 4, the actual anniversary of Hudson's landing on Staten Island, is designed to illustrate the historical development of the island during the past three centuries. The original fauna and flora is shown, either by actual specimens or explanatory labels; the Indian occupation of the island is well illustrated by implements of agriculture, war and the chase, and by a model of a Manahatas Indian village. The colonial period is represented by various old prints, maps, a collection of antiques, etc. There is also a model of the water gate at the foot of Pearl Street during the Dutch period, and a model of the interior of a typical Dutch home. The costumes of various nationalities which have contributed to American citizenship are also shown. The museum is open from 1 to 5 P.M. daily except Monday; on Saturdays it is open from 10 A.M to 5 P.M.

A LETTER has been received at the Harvard College Observatory from Professor E. B. Frost, director of the Yerkes Observatory, stating that Halley's comet was observed visually by Professor S. W. Burnham with the 40-inch telescope, on Sept. $15^d\ 21^h\ 39^m$ G. M. T., in App. R. A. $6^h\ 18^m\ 51^s.1$ and App. Dec. $+17°\ 9'\ 44''$. The comet followed B. D. $+17°\ 1232$ by $12^s.7$, North $4'\ 12''.1$. The comet was also photographed with the 2-foot reflector, on September 15 and 16, by Mr. Oliver J. Lee. A second letter from Professor Frost states that the comet was also observed visually by Professor E. E. Barnard, on Sept. $17^d\ 21^h\ 1^m\ 30^s$ G. M. T., in App. R. A. $6^h\ 19^m\ 0^s.90$ and App. Dec. $+17°\ 9'\ 0''.8$. The comet followed A. G. 2122 $(=+17°\ 1232)$ by $0^m\ 22^s.55$, North $3'$

28″.9. "Description: 15½ magn., 12″ diameter, with possibly a faint nucleus or indefinite fleck of light in it." The comet was also photographed by Mr. Lee at the same time.

Lectures will be delivered in the Lecture Hall of the Museum Building of the New York Botanical Garden, Bronx Park, on Saturday afternoons, at four o'clock, as follows:

September 25—"Native Trees of the Hudson River Valley," by Dr. N. L. Britton.

October 2—"Some Floral and Scenic Features of Porto Rico," by Dr. M. A. Howe.

October 9—"The Flora of the Upper Delaware Valley," by Mr. George V. Nash.

October 16—"Collecting Fungi at Mountain Lake, Virginia," by Dr. W. A. Murrill.

October 23—"Autumnal Wild Flowers," by Dr. N. L. Britton.

October 30—"Some Plant Diseases: their Cause and Treatment," by Mr. Fred J. Seaver.

November 6—"The Reclamation of the Desert in San Bernardino Valley, California," by Dr. H. H. Rusby.

November 13—"The Hudson River Valley before the Advent of Man," by Dr. Arthur Hollick.

It is stated in the *British Medical Journal* that the sanitary commissioner with the government of India has proposed the formation of a permanent organization to inquire systematically into the problems, both practical and scientific, connected with malaria in India. The governor-general in council has decided to convene a conference to examine the whole question, and to draw up a plan for the consideration of the government of India and the local governments. The conference will assemble at Simla on October 11, and is expected to last about a week. Each local government is nominating to the conference an administrative officer of experience, a medical officer and an Indian gentleman.

In February last Surgeon C. P. Wertenbaker, of the Public Health and Marine-Hospital Service, in giving an illustrated lecture on tuberculosis before the Negro Farmers' Conference at Savannah, Georgia, suggested the organization of a State Anti-tuberculosis League for Negroes. The idea was well received and a league was organized. The proposed plan of organization contemplated a league in each state, with a branch in every colored church. This plan, which has been followed, is given in detail in the Public Health Reports of May 28, 1909. The movement was indorsed by the last conference of state and territorial boards of health. Up to August 6, leagues had been formed in the following states: Georgia, Louisiana, Mississippi, North Carolina and Virginia. "A Working Plan" for these leagues has been published in the Public Health Reports of September 3, 1909, giving in detail the method of organization of state leagues and of the local branch leagues. The "Proposed Plan of Organization" and the "Working Plan" have been reprinted, and limited editions are available for distribution to those interested in the work. Requests for copies should be addressed to the Surgeon-General, Public Health and Marine-Hospital Service, Washington, D. C.

The Reale Accademia dei Lincei has, as we learn from *Nature*, made awards as follows: The royal prize for mathematics is divided equally between Professors Enriques and Levi-Civita, and that for social and economic sciences is similarly divided between Professor Rodolfo Benini and Dr. G. Mazzarella. From the Santoro foundation the academy has awarded a prize of 10,000 lire to Professor Quirino Majorana, for his researches on wireless telephony; in addition minor awards to Professor Gabbi, for researches on Malta fever, and to Dr. Canovetti, to enable him to continue his experiments on air resistance. From the same benefaction grants have also been made to Professors Vinassy de Regny and Gortani, for Alpine studies; Professor Gorini, for investigating diseases of cheese; Professor Silvestri, noxious insects; Professor Almagià, study of precipices; the Lombardy commission for seiches on Laghi di Garda and Maggiore; Dr. Abetti, solar physics, in Professor Hale's observatory. The Carpi prize for experimental physiology is divided between Drs. Baglioni and Lombroso. The late Professor Sella has bequeathed to the academy a prize of 1,000 lire, to be awarded annually to some assistant in an Italian physical laboratory.

THE *Electrical World* states that according to M. P. Bellile, a French naval surgeon on board the *Descartes,* which has been engaged in the campaign in Morocco, the members of the ship's company who were employed in wireless telegraph duty developed various affections in consequence of the action of the Hertzian waves. Most commonly the telegraphists complained of their eyes, a slight conjunctivitis similar to that occurring among those who work with arc lamps being found. Although this of itself was not generally serious, in one case where the attacks recurred again and again, keratitis was produced which resulted in a leukoma of the right cornea and consequent impairment of vision. In order to protect the eyes from the ultra-violet rays of electric emanation, it was recommended that yellow or orange glasses should be worn. Not only were the eyes of the operators affected, but two cases of eczema—one of the wrist and one of the eyelid, both very difficult to cure—were seen. One of the officials who had been employed for several years in wireless telegraphy suffered from a painful palpitation of the heart, which came on after working for any length of time at the instruments for sending messages. This man was quite free from any organic lesion of the heart. M. Bellile is disposed to think that a good many of the cases of nervousness and neurasthenia, which seem now to be getting rather common among naval men, may be due to the work which is being done in wireless telegraphy.

UNIVERSITY AND EDUCATIONAL NEWS

IT is proposed to form a University of Detroit by amalgamation of the law and medical colleges already existing in the city.

MRS. RUSSELL SAGE has given $50,000 to Syracuse University for a Teachers College.

THE installation of Dr. A. Lawrence Lowell as president of Harvard University will take place on the morning of October 6.

DR. EDMUND C. SANFORD, A.B. (California, '83), Ph.D. (Johns Hopkins, '88), professor of experimental psychology in Clark University, has been elected president of Clark College to succeed the late Carroll D. Wright. Dr. James F. Porter, of the department of psychology, has been appointed acting dean of the college in the place of Professor Rufus C. Bentley, who has resigned.

PROFESSOR HERBERT J. WEBBER, will act as director of the Agricultural College of Cornell University during the absence this year of the director, Professor L. H. Bailey.

MR. H. I. STOEK, for many years editor of *Mines and Minerals,* has been appointed professor of mining engineering at the University of Illinois. He has recently been serving as an expert of the United States Geological Survey in charge of investigations of waste in mining anthracite. During the past three years he has lectured on mining at Cornell University, Pennsylvania State College, Sheffield Scientific School and Brooklyn Polytechnic Institute.

MR. W. E. WICKENDEN, of the University of Wisconsin, has been appointed assistant professor of electrical engineering at the Massachusetts Institute of Technology, to assume the duties vacated by Professor George C. Shaad, who has gone to take charge of the department at the University of Kansas.

THE following changes have been made in the science departments at the University of Maine for the present year: Ralph H. McKee, Ph.D. (Chicago), professor of chemistry; Charles W. Easley, Ph.D. (Clark), associate professor of chemistry; Benjamin E. Kraybill, B.S. (Franklin & Marshall), instructor in chemistry; G. A. Scott, B.S. (Wisconsin), instructor in physics; E. C. Drew, B.S. (Vermont), tutor in physics; W. E. Wilbur, B.S. (Maine), S. D. Chambers, B.S. (Baldwin), and T. L. Hamlin, M.A. (Missouri), instructors in mathematics; G. E. Simmons, M.S. (Ohio State University), and M. E. Sherwin, M.S. (Missouri), assistant professors of agronomy; W. R. Palmer, B.S. (Oregon Agricultural College), instructor in horticulture; J. R. Dice, B.S. (Michigan Agricultural College), instructor in animal industry; Laura Comstock, assistant professor of domestic science; N. H. Mayo, B.S. (Maine), and W. E. Connor, B.S. (Maine), tutors in civil engi-

neering; E. C. Cheswell, instructor in engineering laboratories; P. L. Bean, B.S. (Maine), promoted to associate professor of civil engineering; A. L. Grover, B.S. (Maine), promoted to assistant professor of drawing.

Dr. Otto Grossner, of Vienna, has been elected professor of anatomy at the University of Prague.

DISCUSSION AND CORRESPONDENCE

THE HARVARD CLASSICS AND HARVARD

I. *The Harvard Classics*

Some one quotes to me a remark of William James's, "That no body of men can be counted on to tell the truth under fire." Perhaps "firing" is, after all, not a very effective method of searching for truth; and perhaps those who do the firing are more bent on making points than on getting to the root of the matter.

Two letters which I wrote during the summer to Harvard officials, on the "Harvard Classics" illustrate, aptly enough, the weakness of controversial methods as a means of securing assent to anything. In one of these public letters I asked Dr. Eliot, and in the other I asked Mr. Henry L. Higginson, trustee of Harvard, whether Harvard College had indeed granted the use of its name to the famous five-foot-shelf publication to which the public is now being invited to subscribe. No public answer was given to the letters; but the fact remains that the university did, by formal vote, lend its name to this book enterprise.

At this time I can realize, in re-reading these letters, that there was in them a good deal of desire to give pain, to see the worst, to nail the claws of the offenders to the ground, to state facts in such a way that the Harvard officials could not answer without making humiliating confessions and without, in effect, acknowledging that I was more virtuous than they.

At the bottom of the whole situation, however, and behind the conditions which produced the "Harvard Classics" there are certain facts about American culture to-day that ought to be considered dispassionately. It required a very peculiar juncture of influences between our educational world and our commercial world to produce "the Harvard Classics."

For the last thirty years Harvard has been struggling to keep the lead among American colleges; and Harvard has been content to take its definition of leadership—to adopt its ideal of leadership from the commercial world. We see in this the atmospheric pressure of industrial ways of thinking upon an educational institution. The men who stand for education and scholarship have the ideals of business men. They are, in truth, business men. The men who control Harvard to-day are very little else than business men, running a large department store which dispenses education to the million. Their endeavor is to make it the *largest* establishment of the kind in America.

Now, in devising new means of expansion, new cash registers, new stub systems and credit systems—systems for increasing their capital and the volume of their trade—these business men have unconsciously (and I think consciously also) adopted any method that would give results. A few years ago their attention was focused upon increasing their capital (new buildings and endowment): to-day it is focused upon increasing their trade (numbers of students). The whole body of graduates is being organized into a kind of "service" to employ Harvard men, to advertise Harvard, to make converts, to raise money, to assist in a general Harvard forward movement.

Henry Higginson and Charles W. Eliot and Dr. Walcott and Dr. Arthur Cabot, and the various organized agencies under them, feel that Harvard should be kept in the front; and they are willing to appeal to self-interest in the youth of the country in order to get that youth to come to Harvard. It is given out that Harvard means help for life; Harvard is for mutual assistance; Harvard means cheap clubs and many friends on graduation. The wonderful ability of the American business man for organization is now at work consolidating the Harvard

graduates into a corps, which, to the casual observer, seems to have much the same sort of enthusiasm about itself as a base-ball club.

I would cite in passing the circulars issued from time to time by Harvard committees upon such occasions as Dr. Eliot's seventieth birthday or the raising of the three million fund—occasions such as arise in the history of any institution, and against which nothing can be said. It is to the language of these appeals, through which Harvard calls upon her "loyal sons" to rally, to shout and to subscribe that I would call attention; for the language is the language of display advertising. Unless there were in the hearts of the men something less bombastic and more reverent than in this literature, it would be hardly worth while to build up the university. Yet these documents are issued by sincere men who are doing the best they know to spread education and righteousness.

The latest form which the business sagacity behind Harvard University has taken to secure cheap advertising for the institution is to lend out the grounds and the name of the college to the most experienced professionals of the epoch, and to allow these professionals to do the rest. The first example of this was the performance of Joan of Arc given by Charles Frohman in the Stadium last spring, in which Maud Adams personated the Maid of Orleans. This show had in it nothing that was artistically justifiable, except the costumes and the training of the supers, both of which were indeed remarkable. The rest of the performance was meaningless and somewhat discreditable to the culture of Harvard. The whole affair, however, was not an example of culture, but of business enterprise. As a result of it, every newspaper in the land contained a column about Harvard College. Note that the professionals were called in; for this is what connects the Joan of Arc with the "Harvard Classics."

I will not pretend that the combination in which *Collier's*, Dr. Eliot and Harvard find themselves embarked was a cold-blooded scheme to exploit the credit of the university and put cash into Dr. Eliot's and Mr. Collier's pockets. It was nothing of the sort. The situation was one into which all of the parties slid by operation of natural force; but the corporation and Dr. Eliot would never have got into it, had not the corporation and Dr. Eliot been long and deeply submerged in commercial measures.

It was an excellent idea of Dr. Eliot's to issue a list of books which he thought good, and have them printed in cheap form. Professor Norton in his last years spent much loving thought over his "Heart of Oak Series of Readers," and went down to his grave honored for this enterprise. But Professor Norton did not find it necessary to borrow the name of the university, nor to submit to the control of a publishing house. The present board of trustees, however, saw in Collier's offer to finance Eliot's project a chance to spread the influence of the college. I will not include President Lowell in these remarks, because I do not know exactly what position he has occupied; and in any case he should be let alone till he is more securely in power. It would be asking too much of him that he should veto a personal pet scheme of his predecessor's in the very moment of his own entry into office. The spreading of the influence of Harvard, then, is what the trustees had in mind—the making of a little money and the doing of a great deal of good is what Dr. Eliot had in mind: the making of a great deal of money and the doing of a little good is what *Collier's* had in mind. But here is the point: Once launched, *Collier's* is in control. The name of Harvard is an asset worth thousands of dollars. The size of the scheme may be measured by the money that *Collier's* is pouring into it. Eliot and Harvard have become mere trade-marks. We shall very likely live to see their names on collar-boxes—a picture of Eliot, a box of soap and a set of the "Harvard Classics."

It is hard to blame Dr. Eliot. He has chosen a list of books, and a little bad taste in the advertising will carry his name and his books where good taste will not carry them. The notes and glossaries of these books will, it is stated, be done by a most competent

hand; and, except that the work is being so hurried as to make scholarship a secondary consideration, these notes and glossaries should be excellent. We must remember, too, that Dr. Eliot is not only a sincere lover of popular education, but is sincerely ignorant of what constitutes higher education.

But what shall we say of the trustees, who apparently are in complete ignorance that they are holding the ægis of the university over the book trade? Does this seem to you to be a small matter, or a matter for laughter? For what purpose does a university exist except to be a guide to the people in true scholarship, to be a light and not a false beacon to the half-educated, to be a touchstone and a safe counselor to those who honor learning and who desire to be led toward her?

There never was a country in the whole history of the world, where the people stood so much in need of honest dealing from their intellectual leaders as they do in the United States to-day. These hordes of well-meaning people, uneducated and yet hungry for education, are apt to believe what any clever person tells them. They become the prey of educational mountebanks, of tawdry impostors, of innocent quacks. "Prophesy unto us smooth things" is their cry. Show us that culture is easy, tie it up in ribbons, let it be a "crimson effect" and bear a souvenir water-mark. Show us that a man may become an educated man by reading for fifteen minutes a day in some certain books, and give us all of them—on a shelf, every one—on the instalment plan.

Culture of this kind our people must have and will have, and it is right that they should have it. They require to be spoon-fed, and we need not have any fear that they will not get their food. But it makes a great difference, to the whole of America, who holds the spoon. Harvard College can not hold it without abandoning her true mission.

II. *Harvard*

Liberty of spirit and of speech is the great gift that education brings with it. A university is a censer of sacred fire at which young men may light their torches, and go out invigorated into the world. They remain throughout life, no matter how uninspired their lives may be, in some sort of touch with the influences of their university. They never lose their enthusiasm, at least, for the name of the place which once evoked it. Amid all the emptiness of college shouting there is the ring of a little golden bell of truth, a sentiment of reverence for intellect, a feeling of unity with the history of mankind. It is this thing, which all universities have in common, that makes them valuable; and not the divergencies upon which they pride themselves. They brag, they compete, they strut; and yet the thing they would bring into honor can only be diminished by competition, and extinguished by bombast.

The fomenting of a "Harvard sentiment" is an injury to Harvard intellect. This *esprit de corps* has been developed to such a pitch of tyranny in some of our colleges that the brains of the boys are often a little addled for life by it. I believe that Harvard has a more liberal tone than the other American colleges. This is due to her antiquity and to her proximity to Boston—for Boston feeds and nourishes Harvard, and educated people have more influence in Boston than elsewhere in America.

It is with a kind of joy that I attack Harvard College, knowing that Harvard supplies the light and the liberalism—hardly elsewhere to be found in America—by which I am permitted to proceed. I should grieve to have this freedom extinguished, as it would be if the alumni were forbidden to take a critical interest in the institution. Loyalty to truth is a fine thing; but loyalty to anything else is an attack upon truth.

It is supposed that Harvard's leadership has been due to her numerical superiority, and that this numerical superiority must therefore be maintained at all costs. It is probably true that Harvard is morally and intellectually in advance of the other American colleges; and it seems likely that she will lose her leadership through her attempts to retain it. She can not compete in size with the state univer-

sities; but she can, by attempting to do so, lose her distinctive position and become illiberal and stupid. Let Harvard abandon the ambition to be the biggest college—or the second or sixth biggest college—and be content to remain the biggest influence in the college life of America. On the day after she had turned her face in this direction, there would be an improvement in spirit in every university in the country. The senseless rivalry to secure students would be, in some degree, relaxed and a new standard of ambition would be introduced. The large sums of money which Harvard is now raising and wasting to her own undoing, could be turned to other uses; and the energy of those men who toil so ceaselessly at Harvard's propaganda could be discharged where it belongs—into the business world.

I do not see any signs of such a change of front on Harvard's part, and I utter this only as a hope, and in an Emersonian spirit. But I will give one piece of practical advice upon the subject, so practical, in fact, that it sounds almost like the advice of a business man.

If you wish to have a university, you must have scholars and scientific men on the governing boards. With the exception of President Lowell there is not a scholar among "The President and Fellows of Harvard College." They are all business men, lawyers or doctors. Now doctors are, for hospital purposes, scientists and scholars; and I will wager that the Massachusetts hospitals will bear comparison with any hospitals in the world from every point of view. But if you should exclude the doctors from the boards of hospital management, as you have excluded learned men from the management of Harvard University; and if you should hand over the Massachusetts hospitals to the management of business men, as Harvard University has been handed over to the management of business men, your hospitals would soon sink below the standards of Europe. Now, learning is not safe if left exclusively in the hands of business men, just as philanthropy would not be safe if left exclusively in their hands. Learning can be protected and transmitted only through the enthusiasm of those men to whom learning is a religion; that is to say, through scholars and the high priests of science.

JOHN JAY CHAPMAN

HISTORICAL GRAPHICS

TO THE EDITOR OF SCIENCE: Referring to the short article on "Historical Graphics," by Dr. Barus (page 272), I might say that two years ago during the summer vacation I worked out a similar historical chart for botany, and used almost exactly the same methods that Dr. Barus has. I went back to several centuries before the Christian era and brought my chart down to 1900 as he did. The chart was made on a long strip of common opaque "curtaining" and I drew lines as he did for the dates. On account of covering so many centuries I allowed but ten inches for each century and did not put in, as he has done, the half centuries. My chart extended something like twenty feet and I followed exactly the plan suggested by Dr. Barus of indicating the life of each man by a horizontal line. In my chart, however, I drew these life symbols as rectangles about two inches high and stretching right and left the proper length. Inside of this rectangle the name of the botanist was printed in capital letters. This has the advantage of avoiding any possibility of mistaking the line belonging to any particular name. After I had worked out my plan on a smaller sheet of paper it was enlarged into the chart of which I speak, and has been hanging for two years across the end of my lecture room. I keep it permanently in place, as in this way students become gradually acquainted with the general distribution of names. I am sure that Dr. Barus's plan is an admirable one, and it certainly has served a very good purpose in my lecture room.

CHARLES E. BESSEY

STATISTICS OF TELEGONY

TO THE EDITOR OF SCIENCE: The letter of Mr. O. F. Cook in your issue of August 20 is so characteristic of the attitude of certain biologists to biometry that perhaps you will spare me space for a brief commentary on it. Mr. Cook writes:

Pearson's plan of proving or disproving telegony by a statistical study of the degrees of resemblance of children to fathers rests more on mathematical ideas than on biological indications, to judge from Thompson's account of it.

I should not like to be responsible for any biologist's account of my work, and it was perfectly open to Mr. Cook, as Thompson presumably cites the locus of my memoir (*Royal Society Proc.*, Vol. 60, p. 273, 1896), to have consulted it, for he writes from Washington. However, he has not chosen to do so, and prefers to suggest that I have not done the very obvious thing to do, namely, compare maternal and paternal resemblances in the case of elder and younger children. I do not know whether a man makes himself ridiculous in the biological field when he criticizes another for not doing exactly what he has done, but I do know what we think of him in the sphere of the exact sciences!

Karl Pearson

SCIENTIFIC BOOKS

BAILEY'S CYCLOPEDIA OF AMERICAN AGRICULTURE

The twenty-five hundred two-column quarto pages of Bailey's "Cyclopedia of American Agriculture," recently from the press, mark a milestone in American agricultural thought. It is a compact library of scientific and usable fact and philosophy of country life in America. Volume I. passes in review the important agricultural features of the United States, her tropical possessions, Canada and Mexico, as seen by many independent observers. It deals with the interior of the farm as conditioned by its environment of soil and climate; with its development by capital and equipment into a source of profit; and with its sanitation and adornment as a place of abode. Volume II. deals with farm and field crops, their botany, their uses, their improvement by breeding, the introduction of better plants, the methods of growing and marketing crops, together with the manufacture and sale of crop products. Volume III. treats of animals, the history of the formation of breeds, the facts, philosophies and practise in animal breeding and animal feeding; the development of live stock products, the methods of preparing for the markets and marketing them. Volume IV. considers the more general matters of rural affairs; of the relations of the farm as a business entity to the world about, our national agricultural resources, the growth of agricultural wealth, machinery, city markets and other forces which impel the increase of agricultural production. Facts are given about land tenures; concerning labor; social, church and economic organizations, both cooperative and under the legal machinery of the state. Education for country life is dwelt upon, as also governmental aid by means of research institutions, and through police control as of fertilizers, feed stuffs, animal diseases and plant diseases.

To this encyclopedia more than a thousand technical agriculturists, general scientists and economists contributed articles or revised the work of others; and the text is illuminated with more than twenty-five hundred illustrations. The primary arrangement of the subject matter under a logical topical classification instead of the ordinary alphabetic arrangement of cyclopedia makes the book more readable and less a mere reference book. These books, at five dollars per volume, will in a way compete with correspondence courses in agriculture. The person who will read intelligently these four books will have absorbed a large part of the best knowledge of American agriculture, and he will find that henceforth he will read agricultural periodicals and technical bulletins and books on agriculture and country life with more discernment—and the farm boy who will read through the more interesting and vital parts of these volumes will enter upon the work of the agricultural school and agricultural college with an advantageous viewpoint not possessed by most of his fellow students. Model farm homes which have a group of boys in their teens will no doubt be the chief markets for these four books. These volumes, together with the bulletins and reports from departments of agriculture and experiment stations, form a splendid basis upon which to start the agricultural side of the farm family library.

These volumes offer the broadest and best general single exposition of the output of our

agricultural research and educational institutions. They form a good key to the body of knowledge already accumulated. They are in part history. Their substance gives prophecy of the greater things which are to come.

In another decade or two science will have not only doubled our definite knowledge of things agricultural, but will have reduced this body of thought to pedagogic form and will have secured it a place beside the three R's in our rural schools. Had these volumes been written two or three years later the author would have placed the consolidated rural school—the farm school out in the open country or in the village—foremost as an educational agency in country life. And the publishers will find that these rapidly multiplying schools, so organized as to support school and circulating libraries in the rural communities, will be one of their largest markets for sets of these volumes.

This encyclopedia will prove of especial value in the library of all secondary schools and colleges, whether patronized by city- or country-bred youth. It will be a source of information not only in regard to subject matter for use in class work—but as the basis of essays, debates and other literary efforts. The presence of this body of knowledge will make it possible for teachers to assign more written work on concrete subjects, that the pupils may devote the actual composition to writing facts, rather than to trying to dig up abstruse thoughts which do not exist in their minds. The opportunity afforded for our youth to know more not only of various aspects of outdoor life, but of our greatest industry and of our most numerous industrial class is important. Not only is it of advantage for city youth to have clear conceptions of farms and farmers, but it is important that country youth should know more of other farms and of the farmers of other communities.

W. M. HAYS
U. S. DEPARTMENT OF AGRICULTURE

Zur Biologie des Chlorophylls. Laubfarbe und Himmelslicht. Vergelbung und Etiolement. Von E. STAHL, Professor in Jena. Jena, 1909.

Professor Stahl is one of the foremost botanists of that school of biologists which attempts to interpret the facts of nature on the hypothesis that everything which endures is useful, that the qualities of an organism which are useless or harmful presently disappear or cause the organism to disappear in the struggle for existence. In the present contribution to philosophical biology Stahl has selected for consideration a subject of prime importance: Why are plants green, why are the organs in which plants manufacture food from inorganic materials green?

It is remarkable that the plants of the earth's surface are green or have green leaves. Few land plants are otherwise colored; the plants living below low-tide mark are, generally speaking, red; many plants between the tide marks, or close to the surface of the sea, are more or less olive, that is, greenish-brown; a large group of more or less unicellular algæ, living on damp soil or in shallow water, both fresh and salt, are olive-brown. Certain bacteria, constituting a small group, are purplish-red. Green is, then, the predominant color of the vegetation of land and sea. And one is disposed to believe that this has always been the case since plants came into existence.

The manufacture of food by plants depends upon energy acquired by absorbing light. The materials first used in manufacturing food are water, of which there is a more or less abundant supply wherever plants exist, and carbon dioxide, of which there has been for ages only a very meager proportion in the atmosphere. The supply of carbon dioxide is practically constant, the supply of water variable both locally and generally, the supply of energy, of light, varies daily, varies locally. The process of food manufacture depends, then, upon two variables and one constant, but the constant is very small in proportion to the other ingredients of the air. I wish to emphasize the small proportion of CO_2 in the air, for unless one realizes this, one will fail to understand why plants, by absorbing more of the available solar energy, could not improve their present case. In fact, one criti-

cism of this paper of Stahl's which may be suggested is that he does not appear to take this small proportion into account.

The color of plants is due to the translucent screen of chlorophyll which absorbs the less and the more refractive rays in sunlight, but does not absorb the green and yellow rays in anything like the same proportion. "Hence leaves appear yellowish-green because the greater part of the red, orange, blue and violet are absorbed by the pigments of the chromatophores." Greater absorption would increase the risk of injuring the leaves by overheating. Under present conditions the absorption of energy from direct sunlight exceeds the amount used in food manufacture. If, however, the proportion and the amount of CO_2 available were greater, a larger proportion of the energy absorbed from direct light would doubtless be used, converted into work, in the manufacture of food, and the possibility of overheating would be less. In diffuse light, on the other hand, the available energy is less while the supply of the food materials remains the same. That the energy supply may be disproportionately small is obvious. Stahl sees, therefore, in the chlorophyll pigments a means of absorbing a due proportion of the energy available in diffuse light. He then proceeds to consider the effect of the atmosphere on sunlight, both the absorption of rays of certain sorts and also the diffusion of what remains.

The majority of botanists live in an atmosphere to which, besides the natural addition of water-vapor, unnatural additions are constantly made, namely, smokes and dusts of various kinds. These three additions, water-vapor, smokes and dusts, increase the amounts and somewhat change the proportions of sunlight naturally absorbed by the atmosphere. One need only mentally contrast the atmosphere of Pittsburgh, London and Leipzig with that of Italy, Arizona and California to realize how true this is. The quantity and the quality of the light reaching the earth's surface in these different places is affected accordingly. Natural air absorbs qualitatively and quantitatively less than unnatural air. Stahl claims that plants have adapted their color, their absorbing agents, to light naturally impoverished in its passage through pure air. The color of leaves is due to a mixture of yellow and green pigments, *complementary* to the dominant colors of the lights in nature. The yellow and orange components, consisting mainly of carotin, are complementary to the blue light of the sky; the green components are complementary to the red and orange which impress us as predominant only when the sun is low, early or late, and its light traverses the atmosphere.[1] This is Stahl's main thesis, to which he recurs again and again.

After this study of the relations of the chlorophyll pigments to the composition of ordinary sunlight there follows a discussion of the adaptations of plants, aquatic as well as terrestrial, to the illumination. These adaptations or adjustments are to the physical as well as chemical properties of sunlight, to heating as well as to food manufacture. It is pointed out that the physical effect of intense illumination may consist in overheating the protoplasm itself or in producing excessive evaporation, which Stahl calls transpiration. These are guarded against in a variety of ways interestingly described. The reaction of the chromatophores themselves to various intensities of light is shown, by reference to Stahl's own earlier work and to the work of others, to consist in changes in the position of the chromatophores and in a "regulation" of the quantities and kinds of pigments in them. Thus Stahl describes the changes of shade or color in insolated parts of plants—in the ordinary green land plants, *Fucus* and other brown sea-weeds living between the tide-marks, the green algæ of fresh and salt water, of the surface or below, the peculiar blue-green algæ which live on mud, etc.

Then comes a study of etiolation, the turning white or the remaining white of plants or plant-parts in the dark. This phenomenon has so frequently been the subject of observation and reflection that, each time it is mentioned, it becomes clearer how little is really known

[1] Stahl's words, "durch das *trübe* Medium der Atmosphere," I find myself unable to translate exactly.

about it. Stahl, recording that the seedlings of all gymnosperms except *Gingko, Welwitschia, Cycas* and *Ephedra* are green even when the seeds sprout in the dark, expresses the suspicion that this fact may have phylogenetic significance. It may; but to the reviewer such speculations, such suggestions, savoring more of the study than of the laboratory, are of little use to science. On the other hand, Stahl did not ascertain whether or not there might be differences in the amounts of light reaching the developing embryos in the ripening seeds of these different classes of gymnosperms. He points out earlier in this paper that the seedlings of maple, etc., which are green in darkness, spring from seeds not covered by opaque coats while they are ripening. Thus we do not know that seeds of pine, for example, if made to mature in darkness on the tree, would not yield as colorless seedlings as those of *Gingko, Welwitschia* and the other "living fossils" if similarly sprouted in the dark.

The next chapter is on the autumn yellowing of leaves. Here are recorded or quoted analyses indicating the differences in the content of leaves before and after the autumn change takes place. Thus in equal pieces of the same leaves cut out (by cork-borer) before and after yellowing there is found to be little change in the proportions of magnesium, an increase in calcium, sodium and sulphur, a decrease to one half in nitrogen, phosphorus, potassium, iron, chlorine and silica. The significance of these facts is thus interpreted: the yellow constituents of chlorophyll are composed of elements which are abundant and easily obtained, whereas the green pigments consist of less abundant elements less easily obtained; so, in yellowing or in etiolated parts, the green is withdrawn or is not formed, and there is a corresponding *economy*. Whether one will agree with this conclusion or will dissent from it will depend upon whether one has, as Stahl himself points out, the ecological or the physiological point of view.

Stahl's paper on chlorophyll is a valuable contribution to the subject. It contains many references to the abundant literature; it suggests both further reflection and more work in the laboratory. It is stimulating, perhaps more so because it is not convincing.

GEORGE J. PEIRCE
STANFORD UNIVERSITY, CALIFORNIA

Tuberculosis, a Preventable and Curable Disease, Modern Methods for the Solution of the Tuberculosis Problem. By S. ADOLPHUS KNOPF, M.D. 8vo, pp. 382, with 115 illustrations. New York, Moffat, Yard and Company. 1909. $2.20 by mail.

Dr. Knopf is the author of numerous monographs on medical, sociological and hygienic subjects. The present volume will be welcomed as it deals in a thorough and most satisfactory manner with one of the most important problems of the human race. This was to be expected from the author of the essay "Tuberculosis as a Disease of the Masses, and How to Combat it," which was originally written in German and received the International Prize from the Congress on Tuberculosis held at Berlin, May 24–27, 1899. Dr. Knopf's essay has since appeared in twenty-seven editions and almost as many languages. The book before us is destined to play a very important rôle in the crusade against a disease which carries off more victims than any other human affliction. It is intended by the author to be helpful to the patient, the family, the physician, the sanitarian, to municipal and health authorities, legislators and statesmen, employers and employees, the public press, professors and teachers, clergy, philanthropists, charity organizations and the people at large. Chapters I. and II. deal with what the patient should know concerning the disease, more especially the nature of the disease, the various channels of infection, such as by inhalation, droplet infection, infection from food substances and infection by inoculations; of these the first two are doubtless the most common modes of infection, while the danger from infected food and inoculations can not be entirely ignored. It is well that the author emphasizes the danger from droplet infection. It

was shown a few years ago by Professor Fluegge and his co-workers, that tuberculous patients, in coughing and sneezing and also in speaking, project into the air within a distance of two and one half to three feet small droplets of saliva containing fresh and virulent bacilli, which when inhaled constitute a special source of danger, unless the patient takes care to hold his hand or handkerchief before his mouth. It is held by many, and we believe correctly, that droplet infection is even more dangerous than the inhalation of infected dust. The author describes very lucidly the methods of the four sources of infection and points out that the touch of the clean conscientious consumptive can not give tuberculosis to others. Chapter III. deals with the duties of the physician towards his patient, the family and the community at large. We heartily endorse the opinion of the author that it is wrong, if not a criminal neglect, to hide from an intelligent adult the fact that he is tuberculous or that a member of his family is affected with the disease.

All that is required is tact, and the task of inspiring confidence is not difficult when we can assure our patients that with proper cooperation and treatment over 80 per cent. of cures of incipient cases have been reported. The chapter also contains excellent suggestions for leaflets of instruction, inauguration of general preventive measures, when to send patients away, maxims in the choice of climate, selection of occupation for persons predisposed to tuberculosis, compulsory notification, disinfection of the sick room, the treatment of the patient's mind, etc. The author very properly favors notification of tuberculous cases to the health authorities, so as to locate the sources of infection, to trace and remove the underlying causes of the prevalence of tuberculosis and last but not least resort to disinfection of the premises upon the death or removal of the patient.

The author's twelve maxims on the subject of climatic treatment are sound and should receive careful consideration by physicians and patients. We fully endorse his strong opposition to sending an impecunious patient to a far-away climate in the hope that in a few weeks he may find light employment, when as a matter of fact he is likely to swell the number of inmates of the hospitals and charitable institutions of the far west. Chapter IV. is of special interest, as it tells us in a most instructive manner how the sanatorium may be adapted to and initiated in the home of the consumptive. In view of the fact that over 90 per cent. of our cases are either too poor or otherwise unsuitable for climatic cures, the practical value of this chapter must be apparent. Indeed we are beginning to realize more and more that while certain climatic conditions are valuable as auxiliary factors, our main dependence is after all an abundance of pure air, and a hygienic and dietetic regimen.

Chapter V. tells us in a most interesting manner how sanitation and proper housing conditions may aid in the prevention of tuberculosis. We quite agree with Dr. Knopf that unsanitary dwellings, overcrowding, lack of pure air and sunshine, are most important predisposing factors to the disease.

His views of the effects of polluted air in the cities, workshops and dwellings, and his plea for wide streets and lower buildings, sanitary houses and model tenements, should be heeded, since general sanitation constitutes one of the most effective weapons in the combat against the disease. The present writer has recently studied the general movement of tuberculosis in this country and Great Britain and finds that the death rate from tuberculosis in Washington has fallen from 446 per 100,000 of population in 1880 to 280 in 1907. In New York City from 433 to 271. In the United States at large from 326 to 183. In Great Britain and in Massachusetts the reduction since 1850 amounts to over 50 per cent. These reductions began long before the combat of the disease was a subject for popular education and are coincident with the introduction of sewers, improved water supplies and the erection of sanitary homes. The marked reduction in the prevalence of consumption after the introduction of sewers observed in England and elsewhere may, to a great extent, be

attributed to the prevention of air pollution and dampness. It is noteworthy that while the reduction in the city of Washington coincident with the introduction of sewers amounts to 37.3 per cent., the reduction in Baltimore, an unsewered city, is only 24.7 per cent.

Erismann has calculated that a cesspool with 18 cbm. contents is capable of polluting the atmosphere in the course of twenty-four hours with 18.79 cbm. of impure gases and it requires no great stretch of the imagination to calculate the amount of air pollution which resulted from the cesspools and other makeshifts prior to the introduction of the sewerage system. The relation of dampness to consumption may be explained as follows: Sewers help to drain the soil. Dampness of soil, unless special precautions have been taken, extends by capillary attraction to the walls and renders the entire house damp. Damp air abstracts an undue amount of animal heat, lowers the power of resistance of the inmates and predisposes to catarrhal affections and these in turn render the mucous membranes more vulnerable to the invasion of the tubercle bacilli. There is also reason for believing that the bacilli retain their vitality for a greater length of time in such an atmosphere on account of its humidity and excess of organic matter. At all events it has long been known that tuberculosis is far more prevalent in damp, dark and unsanitary houses. It is difficult to explain how pure water is connected with the deaths other than those from water-borne diseases, yet when we consider that water enters into the composition of the human body to the extent of 60 per cent., we are in a position to appreciate the sanitary acumen of Aristotle when he wrote in his "Politica": "The greatest influence on health is exerted by those things which we most freely and frequently require for our existence, and this is especially true of water and air."

Chapters VI. and VII. deal with the duties of municipal, state and federal health authorities in the prevention of the disease. Dr. Knopf's presentation of what has been accomplished and his many valuable suggestions as to what more needs to be done are of interest and importance. Chapter VIII. enters very fully into the subject of factory and office hygiene—tuberculous employees and servants, general railway sanitation, the farmer's duty in the prevention of tuberculosis in man or beast—and is replete with valuable facts and recommendations. Chapter IX. is one of the most important of the series, dealing as it does with the duties of school teachers, educators and the public press in the combat against tuberculosis. He makes a strong and just plea for school sanitation with special reference to ventilation, lighting and heating, gymnasia, playgrounds and swimming pools and offers many valuable suggestions to those entrusted with the physical development of the nation's most valuable assets. Dr. Knopf offers an alphabet suited for the understanding of younger pupils, in which he points out "the numerous sources of tuberculous infection to which the child may be exposed at school and what the child itself can do to overcome the possible sources of infection." This alphabet should be adopted, as it will prove of immense benefit to the present and future generations, without exciting an undue fear of the disease. The author's description of scrofulous children and those predisposed to the disease, and his plea for open-air schools for such children, should strongly appeal to all educators.

Chapter X. deals with church hygiene, hospitals, cremation, the Emmanuel church movement, value of cooperation in anti-tuberculosis work, need of sanatoria for tuberculous children, sanatoria in the United States and illustrations of different types, social and medical mission of the sanatorium, philanthropic consumptives, day and night camps, class methods, etc. Chapter XI. deals very fully with the duties of the people in the combat of tuberculosis, the early signs of the disease recognizable by the laymen, educational methods by free lectures and literature, overcoming an inherited tuberculous predisposition, hygiene of pregnancy, nursery hygiene, dress and hygiene for children, tight lacing, child labor, alcoholism as a predisposing factor in the disease and its prevention. The author, while a

strong advocate of temperance, is opposed to prohibition and in favor of the Gothenburg system, educational methods and the creation of clean and wholesome amusements calculated to counteract the evil influence of saloons; we heartily endorse his general views on the alcohol question and his opposition to the pernicious system of treating. We regret that Dr. Knopf, an evident believer in home-making, did not emphasize the value of good wholesome food as a preventive factor in alcoholism, especially since the cold dinner pail and badly prepared food create an appetite for alcoholic beverages. In Chapter XII. the author discusses the prospects of the ultimate eradication of tuberculosis and quotes two encouraging sentences from the writings of Pasteur. Dr. Knopf has shown that tuberculosis is a preventable and curable disease—we firmly believe that if the measures recommended by him in his book, and which have been known to sanitarians for some time, were generally adopted, the great "white plague" which now carries off annually over 150,000 victims in the United States alone would be eradicated within one or two generations.

Geo. M. Kober

Georgetown University

SCIENTIFIC JOURNALS AND ARTICLES

The Journal of Experimental Zoology, Vol. VII., No. 1 (August, 1909), contains the following papers: "The Production of New Hydranths in Hydra by the Insertion of Small Grafts," by Ethel Nicholson Browne. A stock hydra may regenerate a new hydranth in region of graft if (1) a tentacle with peristome tissue at its base, or (2) just peristome tissue without the tentacle, or (3) regenerating head material, or (4) bud tissue, is grafted in any region except the tentacle region. In the foot region, the new hydranth pinches off as a minute hydra of about one tenth normal size. In and above the middle region, the new hydranth is of normal size. The origin of regenerating material and the fate of absorbed material is shown by grafts of normal green with artificial white hydras. "The Effect of the Destruction of Peripheral Areas on the Differentiation of the Neuroblasts," by M. L. Shorey. The purpose of these experiments was to study the behavior of portions of the developing nervous system when it is itself left quite intact and with all its relations normal, but with the primordia of the organs which it should innervate extirpated before innervation. In every instance it was found that the neuroblasts do not differentiate except in the presence of their normal end organs, or of others of a similar character. "Factors of Form Regulation in *Harenactis attenuata,* II., Aboral Restitution, Heteromorphosis and Polarity," by C. M. Child. In the esophageal region of the actinian *Harenactis* tentacles form at both oral and aboral ends of isolated pieces, but at all levels proximal to the esophagus tentacles appear orally and a foot aborally. The two internal factors determining the polar phenomena are the constitution at the various levels of the body, and the physiological correlations between the parts composing the piece. "Some Effects of External Conditions upon the White Mouse," by Francis B. Sumner. The most important conclusions from these experiments are (1) that certain readily measurable structural modifications have been produced by changes of temperature, corresponding to some of the differences between northern and southern species or varieties of mammals; and (2) that there is a distinct tendency toward the reduction of these experimentally produced differences during subsequent growth, even when the conditions which gave rise to them remain unchanged. "Further Observations of the Behavior of Tubicolous Annelids," by Chas. W. Hargitt. The paper supplements earlier observations and experiments by the author on the behavior of this interesting group of annelids, tabulating in considerable detail the various reactions. It also emphasizes the importance of behavior under natural, as compared with artificial, conditions, and points out the important significance of the complex aspects of the tubes themselves as expressions of behavior. The results fail to show any evidence in support of the so-called tropism theory of behavior.

The Journal of Biological Chemistry, Vol. VI., No. 5, issued September 16, contains the following: "On the Decomposition of β-Oxybutyric Acid and Aceto-acetic Acid by Enzymes of the Liver," by A. J. Wakeman and H. D. Dakin. An enzyme, "β-oxybutyrase," was detected in liver tissue which, in the presence of oxygen, converts β-oxybutyric into aceto-acetic acid. Another enzyme was detected which decomposes aceto-acetic acid. Conditions influencing their action were studied. "The Leucin Fraction of Proteins," by P. A. Levene and Donald D. Van Slyke. The substances l-leucin, d-isoleucin and d-valin, which make up the leucin fraction in the hydrolysis of protein, may be quantitatively separated from each other by transformation into the lead salts. "The Leucin Fraction in Casein and Edestin," by P. A. Levene and Donald D. Van Slyke. Quantitative estimations of l-leucin, d-isoleucin and d-valin resulting from the hydrolysis of casein and edestin. "The Nature of the Acid Soluble Phosphorus Compounds of Some Important Feeding Materials," by E. B. Hart and W. E. Tottingham. A study of the distribution of phytin and inorganic phosphorus in corn, oats, barley, rutabagas and alfalfa hay. "A Volumetric Method for the Estimation of Casein in Cow's Milk," by E. B. Hart. The method consists in measuring the amount of standard alkali neutralized by the casein from a measured sample of milk. "On Preformed Hypoxanthin," by V. N. Leonard and Walter Jones. Preformed hypoxanthin, *i. e.,* that not formed from adenin by action of adenase, is present in all tissues, especially in muscles, and contributes largely to the endogenous uric acid of the body. "The Intracellular Enzymes of Lower Fungi, Especially those of *Penicillium camemberti,*" by Arthur Wayland Dox. From *Penicillium camemberti* enzymes were separated capable of decomposing certain proteins, nucleic acid, amides and amido-acids, glucosides, esters and carbohydrates.

THE Higher Education Association, whose office is at 42 Broadway, New York, has begun the publication of a monthly magazine entitled *The American College.* In addition to editorial articles and various departments, the first issue contains the following articles:

"The Carnegie Foundation's Dual Mission": F. B. Lawrence.

"Sensational Attacks on University Teachings": Edwin E. Slosson.

"College Bookkeeping and Accounting": Clarence F. Birdseye.

"A Victorious Defeat" (Story): George Thomas.

"The Moral Ideal and the Pursuit of Knowledge": Francis J. McConnell.

The directing editor of the journal is Mr. Clarence F. Birdseye, known for his books on "The Reorganization of our Colleges" and "Individual Training in our Colleges," and the managing editor is Mr. Frank F. Rogers. The Higher Education Association was incorporated in the state of New York last May. The first of the purposes of the corporation, according to the charter, being "to improve higher education throughout the United States, and in particular the internal and external conditions of the American college, by furnishing an agency and funds whereby a careful study can be made, and improvements can be brought about in the institutions of higher learning." The directors of the corporation are: Colonel C. E. Sprague, the Hon. George B. Cortelyou, Mr. Clarence F. Birdseye, Dr. E. E. Slosson, Dr. Virgil Prettyman, and Mr. Arthur H. Pogson.

THE editor of the *Monthly Weather Review* announces that beginning with the issue for July, 1909, the *Review* will be restricted to statistical tables of general climatological data for the United States. The relatively small amount of accompanying text will summarize the weather conditions of the month in the different districts. It is thus evident that hereafter the *Review* will be of value only to those advanced students of climates, engineers, etc., who need detailed data for their own discussion. Few papers of general interest to teachers, except as related to climatology, will be published in the *Review,* and it is not probable that the publication will be of value to those public schools and high schools that have been receiving it heretofore. The scope of the articles appearing in the Mount Weather

Bulletin will be limited to technical treatments of subjects of advanced research. This will make most of the articles of that publication also beyond the comprehension of the average pupil of the above grades of schools, and make the bulletin only appropriate for the libraries of colleges and universities.

SPECIAL ARTICLES

THE PERFECT STAGE OF LEAF-SPOT OF PEAR AND QUINCE

It is well known that the "leaf-spot" of the pear and quince is caused by an "imperfect fungus" called *Entomosporium maculatum* Lév. The perfect stage, however, is not so well known, although it is probably very common in both Europe and this country, but may be easily overlooked. It occurs quite abundantly on the leaves of the pear and quince, affected with the disease, which have lain on the ground during the winter. Such leaves are very commonly affected in the spring with species of *Sphærella,* as *S. sentina* and *S. pyri.* These two species are also "perfect" stages of fungi, but very different from the perfect stage of the leaf-spot caused by *Entomosporium.* Their fruit bodies are black and project slightly from the surface of the dead leaves and thus are quite conspicuous objects even on the dry leaves when examined with the pocket lens.

The fruit bodies of the perfect stage of *Entomosporium* are, however, usually very inconspicuous and are not easily, if at all, recognized with the aid of a pocket lens, in the dry state, because they are collapsed. When the leaves are wet, however, and the fruit bodies are mature, their contents are swollen and thus crowd apart the thin wall and expose the white tips of the asci in a more or less elliptical area. This character of the fruit body shows that the fungus is one of the Discomycetes. The asci are eight-spored, the spores hyaline and two-celled, while the asci are accompanied by paraphyses. Sorauer[1] first called attention to the perfect stage of *Entomosporium* on leaves of *Cotoneaster tomentosa* and *Pirus communis* silv., but placed the fungus in the genus *Stigmatea,* one of the Sphæriales closely related to the *Sphærella* but differing chiefly in the possession of paraphyses.

Twelve years ago I called attention to this perfect stage which I found on quince leaves at Ithaca, and identified as *Fabræa,*[2] at the same time pointing out how easy, under certain conditions, it might be to mistake it for a *Stigmatea.* The connection of the fungus with the *Entomosporium* by Sorauer was assumed because it follows the *Entomosporium* during late autumn and in the spring in the same tissues of the leaf. While I have several times grown the *Entomosporium* from quince fruit in pure cultures, I have never obtained the perfect stage in these cultures. I have, however, carried the cultures in the opposite direction, by obtaining the *Entomosporium* in pure cultures from ascospores of the *Fabræa.*

I hope before long to publish a full account of these studies, but in the meantime it seems desirable to indicate the name of the fungus in its new position. Sorauer's studies were concerned with *Entomosporium mespili* (DC.) Sacc., and he employed the name *Stigmatea mespili*[3] (DC.) Sor. This fungus would therefore be *Fabræa mespili* (Sor.) while the one I have worked with (*Entomosporium maculatum* (Lév.)) becomes *Fabræa maculata* (Lév.). There is a strong probability that these two species are identical, since the only difference between *Entomosporium maculatum* Lév., and *E. mespili* (DC.) Sacc., aside from differences in size of the spores and these will not, it appears, hold, as given in the descriptions, is that the lateral cells of the spore are depressed in the former, while they are a little larger and more rotund in the latter.

Geo. F. Atkinson
Department of Botany,
Cornell University

[1] "Pflanzenkrankheiten," Zweite Auflage, 2, 372–377, 1886.

[2] "Leaf-spot of Pear," *Garden and Forest,* 10, 73–74, 1897.

[3] *L. c.,* p. 371. See also Sorauer, P., "Handbuch du Pflanzenkrankheiten," Dritte Auflage, 2, 237, 1908, where the perfect stage is given as *Stigmea mespili* Sor.

NOTES ON TWO COMMON TURTLES OF EASTERN UNITED STATES

THE speckled tortoise (*Clemmys guttatus*) Schneider is one of the commonest and most conspicuously colored turtles of much of the eastern United States. Its shell or carapace is smooth, black, with a sprinkling of round, orange-yellow spots. The plastron is yellowish with darker markings. This pretty turtle is largely aquatic in its habits, but is frequently found wandering among the vegetation of wet, swampy grounds. This turtle is, without doubt, of considerable economic value, as shown by the published data of its stomach contents determined by the Zoological Division of the Pennsylvania Department of Agriculture. It is here proved that this turtle is mainly insectivorous in its feeding habits, and for this reason deserves to be protected.

Concerning the food of this species, a number of the early writers state that it captures frogs. There is little doubt but that frogs occasionally enter into its diet. I myself once watched one of these turtles pursue a small frog very actively in a brook at Oxford, Mass. At that time an excellent observer also informed me that he saw one of this same species capture a small frog.

Another interesting turtle is the wood turtle (*Clemmys insculptus*) LeConte, not infrequently met with in the eastern states. It is very largely terrestrial in its habits, and may frequently be found wandering through dry woods and fields far from any water. In New England, late in winter and in March, I have captured numbers of these turtles, near Charlton, Mass. In spring and summer it extends its wanderings into the upland fields and woods. During the period of spring fires, I have frequently found this turtle burned to death in dry woods and fields, where it had been overtaken by brush fires.

Several years ago at Oxford, Mass., I carried one of these turtles to a point in a pasture near my home, in order to observe some of its feeding habits. Set free, the turtle headed for a dry, rocky pasture, across which extended a portion of a steep cliff. It pursued a course directly toward this cliff. I followed cautiously a few feet behind, on my hands and knees, keeping immovable if the turtle turned its gaze toward me. In this manner I spent the entire afternoon observing this turtle, and learned a good deal concerning its food habits. It fed greedily on any mullein leaves (*Verbascum thapsus*) in its path, and seemed especially fond of common sorrel (*Rumex acetosella*). It climbed slowly up the grassy banks bordering the cliffs, and finally gained a spot where grew various weeds and shrubs in the loose soil and rock crevices. When several feet away, its keen eye spied some large, red wild strawberries on a certain bank. It was interesting to see how eagerly and hurriedly it scrambled toward these berries. It spent considerable time among them, reaching up and clawing down the plants in order to reach the berries which it raked off awkwardly, together with the leaves, into its jaws. Later, its course led toward a swamp.

The food of this turtle is largely of vegetable composition, although varied animal matter consisting of insects, molluscs, etc., is eaten, as shown by examinations of its stomach contents by the Pennsylvania Department of Agriculture. Feeding largely as it does on all sorts of vegetable matter—leaves, berries, etc.—it no doubt incidentally includes more or less insects and slugs which may be present at the time, especially on those lower portions of the plant accessible to it.

I have frequently found females of the wood turtle excavating holes and laying eggs in early summer, in sand beds washed in by overflows of the Maanixit River at Oxford, Mass., and in the bare, loose sandy soil of more upland situations.

As a class the habits of our turtles need considerably more attention, in order to make us better acquainted with their economic position with regard to agriculture. If it is shown that they are, as a class, beneficial as destroyers of vermin and noxious insects, etc., then they must be considered one of the natural agencies tending to promote agricultural interests just as much as the useful birds and

toads, and for that reason we owe them every protection.

H. A. Allard
Bureau of Plant Industry,
Washington, D. C.

On Artificial Parthenogenesis of the Sea-Urchin Egg

From July 1 until now I have been studying artificial parthenogenesis in *Arbacia punctulata*. I succeeded in rearing the larvæ made parthenogenetic by treatment with carbonated sea-water (5 minutes) followed by hypertonic sea-water (about 30 minutes) for several weeks in Roscoff filter-aquaria. At the end of a month there were so few alive that I did not consider further attention to them worth while, owing to the possibility (though improbable) of contamination with foreign plutei when renewing the water (that was dipped up daily at the end of the wharf at high tide). I found no constant difference between parthenogenetic and fertilized larvæ.

It thus being doubtful that I could produce sexually mature adults parthenogenetically, I confined my further studies to early phases. J. Loeb considers the essential event in artificial parthenogenesis to be the production of a free-swimming embryo or larva—but why larva rather than any other stage. In natural parthenogenetic development the end result may be a maturation or segmentation stage or a larva or adult. Though only the reproductive adults are of significance to the species, all are of significance to science. It might also be remembered that Loeb's parthenogenetic *Chætopterus* "larvæ" were unicellular structures, resembling trochophores only in the possession of cilia and by an irregular redistribution of cytoplasm, and were incapable of further development.

In *Arbacia punctulata* maturation takes place in the ovary, but no segmentation occurs without fertilization or an artificial stimulus. The ovarian egg is surrounded by a thick coat of a jelly-like proteid that swells slightly and gradually dissolves in sea-water. It is practically invisible, but can be located by adding to the medium, Chinese ink, the particles of which stick to its surface. The inner surface of the jelly fits tightly against the egg. The jelly is stained by neutral red or methylene blue, which causes it to contract and pull away from the egg. Acids cause it to contract and become more dense and sticky. Tannin coagulates it into a coarsely granular yellowish mass. Alkalies cause it to dissolve more rapidly, as does also agitation. When the egg is fertilized or put in "membrane-forming" solutions a fluid is extruded which pushes the jelly out from the surface of the egg. The inner surface of the jelly is then sharply defined and is probably bounded by a thin membrane (the "fertilization-membrane") as spermatozoa wriggle freely through the jelly but can not pass its inner surface.

As membrane formation does not occur in all parthenogenetic *Arbacia* eggs it was considered of secondary importance. The next change seen in developing *Arbacia* eggs is the migration of the red pigment plastids to the surface. I first thought this due to the formation of asters, but on sectioning could find none. In the living egg these plastids take up neutral red or methylene blue before other parts of the egg, and in fixed material stain with Delafield's hæmatoxylin stronger than other parts of the cytoplasm. Parthenogenetic reagents when used in sufficient concentration cause the pigment to diffuse out of these plastids into the surrounding cytoplasm and from it into the sea-water, showing that both plastid membrane and cell plasma membrane are permeable at this time.

Loeb showed a similarity between hæmolysis and artificial membrane formation. It has long been supposed that hæmolysis is due to an increased permeability of the plasma membrane as hæmoglobin diffuses out. Ralph Lillie supposes artificial parthenogenesis and stimulation to be due to an increased permeability of the plasma membrane. This assumption is supported by my observation of the diffusing out of the pigment in the *Arbacia* egg.

Repeating the experiments of others and making new ones, I tried various types of agents that cause hæmolysis or stimulation to see whether they caused parthenogenetic development in *Arbacia*. I succeeded in causing segmentation by isotonic NaCl and by the

following chemicals and conditions in sea-water: acids, alkalis, hypertonicity, hypotonicity, ether, greatly diminished oxygen, potassium-cyanide, heat, cold, induction shocks and mechanical agitation. In many cases the eggs segmented while they remained in the artificial solution. They would not segment in sea-water charged with carbon dioxide unless most of the gas were allowed to leave the sea-water. They segmented in weak alkalis, hypertonic sea-water, diminished oxygen, KCN and cold.

From the above we may conclude that the various parthenogenetic agents could not have a similar chemical action and must have some common physico-chemical action, most probably changing the permeability of the plasma membrane, thus allowing the escape of carbon dioxide (as suggested by Lillie). The fact that eggs will not segment in concentrated carbon-dioxide demonstrates the last point. Lyon showed that the escape of carbon-dioxide from sea-urchin eggs varied rhythmically during cleavage, which suggests that a period of increased permeability is necessary for each cleavage. The stimulus to parthenogenetic development need only be applied once and the egg becomes automatic like any other cell.

The question arises whether these agents have any additional effect besides changing the permeability of the membrane. When the membrane becomes permeable some of the reagents must enter the cell. Probably this is the reason that some reagents start development that continues indefinitely, whereas after others development soon ceases (the eggs being injured by the reagent). Some chemicals may cause an irreversible permeability that does not initiate segmentation but causes death, but these will not be considered. It seemed to me that if the reagents caused a simple physical change, one could be made to act as quickly as another by finding the proper concentration, and this I tried to do. Fifteen seconds' exposure was sufficient with acetic acid while about seventeen hours was necessary with potassium cyanide. It is evident that the actions of the two are different. Probably the KCN slowly enters the egg while the membrane is relatively impermeable and by retarding certain enzyme actions brings about increased permeability of the membrane. Or the KCN may make the membrane permeable immediately and then enter the egg, retarding the production of carbon-dioxide and thus necessitating a longer period of permeability.

Since the egg becomes automatic after one of a number of stimuli the question arises why it did not remain automatic like every other cell in growing regions of the mother. In studying the cell lineage of parasitic Copepods I found that the germ cells could first be distinguished from the soma cells by their slow rate of division. In the thirty-two cell stage, one cell is the primary germ cell and it does not divide as soon as the other cells do, but grows larger than they do. Probably its failure to become sufficiently permeable to divide as soon as the others allows it to grow larger and become the germ cell. This may be true of all its progeny and in the final generation, the primary oocytes, enormous growth takes place and division is impossible without a special stimulus. The plasma membrane may not be sufficiently permeable for cell division and yet allow the passage of nourishment. Perhaps fats and lecithin may enter the cell by dissolving in the lipoids of the membrane.

To sum up, we may conclude that all agents initiating parthenogenetic development in the egg of *Arbacia* cause increased permeability of the plasma membrane, but some agents act differently from others, either by having an indirect action or by producing additional effects.

J. F. McCLENDON

WOODS HOLE, MASS.,
Aug. 31, 1909

SOCIETIES AND ACADEMIES

AMERICAN MATHEMATICAL SOCIETY

THE sixteenth summer meeting and sixth colloquium of the society were held at Princeton University during the week September 13 to 18, 1909. The four sessions of the summer meeting proper occupied the first two days. Thirty-nine members were in attendance. At the opening session Professor Fine presided, being relieved at the later sessions by Professor Morley and Vice-presidents Kasner and Van Vleck. The following new

members were elected: Dr. L. S. Dederick, Princeton University; Dr. G. E. Wahlin, University of Illinois; Mr. E. E. Whitford, College of the City of New York. Eleven applications for membership were received.

It was decided to hold the annual meeting with that of the American Association at Boston. A grant of 5,000 francs was made from the treasury of the society in support of the proposed publication of the works of Euler. A committee was appointed to prepare suitable resolutions on the death of ex-President Simon Newcomb.

On Tuesday the members were conducted through the grounds and buildings of the university. Tuesday evening was marked by a reception at the house of Professor Fine.

The following papers were read at the summer meeting:

L. P. Eisenhart: "Congruences of the elliptic type."

Dunham Jackson: "Resolution into involutory substitutions of the transformation of a bilinear form into itself."

F. W. Reed: "On singular points in the approximate development of the perturbative function."

Virgil Snyder: "Surfaces invariant under infinite discontinuous birational groups defined by line congruences."

Joseph Lipke: "Natural families of curves in a general curved space." Preliminary communication.

A. S. Hawkesworth: "A new theorem in conics."

Anna J. Pell: "Applications of biorthogonal systems to integral equations."

G. C. Evans: "The integral equation of the second kind, of Volterra, with singular kernel."

Edward Kasner: "Triply orthogonal systems of surfaces."

Edward Kasner: "Natural families and Thomson's theorem."

G. A. Miller: "The groups which may be generated by two operators s_1, s_2 satisfying the equation $(s_1 s_2)^\alpha = (s_2 s_1)^\beta$, α and β being relatively prime."

F. R. Sharpe: "Integral equations with variable limits, with an application to the problem of age distribution."

R. D. Carmichael: "Note on a new number theory function."

T. E. McKinney: "On a criterion for λ-developments in the theory of equivalence."

G. G. Chambers: "Groups of isomorphisms of the abstract groups of order p^2q."

W. R. Longley: "Note on some periodic orbits with more than one axis of symmetry."

W. H. Bussey: "Tables of Galois fields of order less than 1,000."

W. B. Ford: "On the relation between the sum formulas of Hölder and Cesàro."

Oswald Veblen: "Products of pairs of involutoric projectivities."

G. F. Gundelfinger: "On the geometry of line elements in the plane with reference to osculating vertical parabolas and circles."

P. F. Smith: "Theorems in the geometry of surface elements in space."

R. G. D. Richardson and W. A. Hurwitz: "Note on determinants whose terms are certain integrals."

R. G. D. Richardson: "The Jacobi criterion in the calculus of variations and the oscillation of solutions of linear differential equations of the second order."

I. J. Schwatt: "Methods for the summation of infinite series."

A. B. Coble: "Cubic space curves that meet the Hessian of a cubic surface in six pairs of corresponding points."

G. D. Birkhoff: "On the theory of stability."

H. W. Reddick: "Geometric properties of a system of tautochrones."

W. B. Carver: "The poles of finite groups of fractional linear substitutions in the complex plane."

L. S. Dederick: "The solution of the equation in two real variables at a point where both the partial derivatives vanish."

H. T. Burgess: "On point-circle correlations in the plane."

H. B. Newson: "A general theory of linear groups."

A. R. Schweitzer: "A formal extension of Bolzano's series."

The colloquium opened on Wednesday morning. Two courses of four lectures each were given by Professor G. A. Bliss, on "Fundamental existence theorems," and Professor Edward Kasner, on "Geometric aspects of dynamics." Thursday afternoon was devoted to an excursion to Washington's headquarters at Rocky Hill.

The San Francisco section of the society held its regular meeting at the University of California on September 25. The next meeting of the society will be held at Columbia University on October 30.

F. N. Cole,
Secretary